CALIFORNIA JOURNAL
OF SECONDARY EDUCATION

Vol. 18 MAY, 1943 No. 5

Mathematics in California Secondary Schools

THE symposium in this issue is the realization of a dream and, at the same time, the culmination of many years of work on the part of the mathematics teachers of California. To be able to understand that statement, one must go back in his thoughts to the time when the average school man would have considered it rank nonsense to think, first, that a symposium on this subject would be of interest to a sufficient number of people to warrant its inclusion in a journal such as this, and, second, that even if space were allotted for such an adventure there would be enough material to fill it. Times, however, have changed. War has turned the spotlight on mathematics and in so doing has revealed our failure to recognize its importance within the framework of the school program.

It must not be thought that the situation has gone unnoticed by the teachers of this subject. That would be an entirely unwarranted assumption. Quite to the contrary, they have been only too well aware of the shortcomings. Their sin, if it can be called such, is their failure to exert sufficient influence in the recent curriculum revisions that have been going on over the country. It is probable that they have been too close to the problem to get the proper perspective.

Before we get too harsh in our criticism of either the curriculum specialists or the mathematics teachers, we should remember that the organismic viewpoint in psychology is only in its infancy and that most of us were nurtured in the mechanistic school of thought. Habits developed in early school life are likely to stick. Failing to view the whole educative process has caused an unhappy situation for mathematics in particular and the schools in general.

DURING the Christmas holidays of 1942, an "Institute on Mathematics in the Emergency" was held at Stanford University. The invitations were sent in the name of the National Council of Teachers of Mathematics. Those who came were the hardy souls who had forsaken the home fireside with its attendant possibilities for a much needed rest for the dubious possibility that this meeting *might* prove to be profitable. They came from the north, from the south, from the east, from the west. It was truly a geographical representation. Yes, they came, they saw, and they were conquered. An institute can be successful, it can be practical, and it can be pleasant.

But it was more than a geographical distribution. The personnel was diversified as to positions and interests as well. Present were the "old guard" whom one has learned to expect at all meetings of the NCTM, but in addition were new faces, showing that the future is hopeful. Classroom teachers, heads of departments, supervisors, principals,

and city, county, and state representatives from the offices of the superintendents were in attendance. From the colleges and universities came consultants, panel participants, and just plain listeners.

Pomona College sent Professor Jaeger, who heads their Department of Mathematics and who succeeded in winning the hearts of the conference with his sound thinking plus an inexhaustible store of droll humor. From Chico State came Professor Iloff, an old stand-by in our region. Professor Siemens demonstrated that the Education Department of UC is not asleep at the switch. Invaluable advice in preparing the program came from such old friends as Professors Evans and Levy of the Mathematics Department at UC, Whyburn of UCLA, Spencer of Claremont, and Bacon of Stanford.

Stanford not only allowed the use of its Education Building, but many members of the faculty at Stanford gave unsparingly of their time. Special note should be made of the coöperation of Dean Kefauver, Professor Grant, and Miss Doyle. Then there is the man without whom there would have been no institute, none other than our newly found friend, Lucian B. Kinney, whose name soon will become synonymous with coöperation. These representatives from the colleges and universities, together with many whose names are not listed, gave stability to the sessions.

The armed services were represented by Commander Melandy, USNR, and Colonel Shute, USA, in person. A paper prepared by Lieutenant Commander Martin of St. Mary's Preflight School was read. What these three men had to say, combined with advice from Commander Pierce of St. Mary's and Major Barnett of Santa Ana, gave us the constructive criticism that was needed to give flavor to the meeting.

From the publishers came samples of new and old textbooks which they felt would be valuable aids in our present emergency. In many cases, representatives were present. To many, one of the most interesting sectional meetings was one in which these representatives participated in the discussion.

The articles in this issue of the Journal do not purport to be a summary of this meeting—that job was done most ably in the first issue of the journal published by our newly formed state organization. Of this, more will be told later. It is hoped, however, that the papers included in the symposium will bring some of the spirit of our institute to those who were not with us and at the same time present something new to those who were. To the institute must go the credit for the inspiration and courage that have made this symposium possible.

THE need for a state association has been apparent for some time. The organization of such an association was another fruit of our institute. The California Mathematics Council is the name chosen for the new organization. The goal of the officers and members will be to make it a vitally functioning part of the mathematics program of our state. It is not a branch of the National Council of Teachers of Mathematics, nor is it meant to be a substitute for it. One of its aims will be to supplement the work of that organization. There is a place for both, and by close harmony between the California representatives of the NCTM and the CMC we hope to enrich the offerings of each.

The officers of the CMC for 1943 are: president, Mrs. Ruth G. Sumner, Oakland High School; vice-president, Dale Carpenter, curriculum coördinator,

Los Angeles City Schools; secretary, Miss Florence Flanagan, San Jose State College; treasurer, Miss Harriette Burr, Ventura Junior High School, Ventura; past president and ex-officio member of the Board of Directors (by resolution), Miss Emma Hesse, University High School, Oakland; executive secretary, Prof. L. B. Kinney, Stanford University; advisers, (1) Prof. Chester Jaeger, Pomona College, (2) Commander F. B. Melandy, Twelfth Naval District, San Francisco; and (3) Charles Grover, principal of Glenview Elementary School, Oakland.

This group comprises the Executive Committee, whose duty it shall be to formulate policies and plans of action to be recommended to the Association and to determine needed research and direct publication thereof. This committee, together with the section representatives, viz., Professors Spencer of Claremont, Kinney of Stanford, and Iloff of Chico State, and the several county representatives will try to carry out the aims as stated in the constitution, which are: To promote the effectiveness of the teaching of mathematics and to initiate and direct activities to this end.

One of the policies of the CMC will be the publication of at least four journals each year. At present the journal actually is a mimeographed bulletin, and Professor Kinney, as executive secretary, carries the responsibility of editing and publishing these bulletins. The first issue indicates that a brilliant future is in store for the new publication.

Another policy of the Council is to "carry the word" to those who are not fortunate enough to be able to get to the larger centers for meetings. Several counties already have had mathematics institutes on Saturdays, and more are in the process of planning them. The CMC does all in its power to stimulate interest in this type of meeting and lends aid in obtaining consultants. A letter to the president is all that it takes to start the ball rolling.

SOME of the problems facing mathematics departments today are: (1) the weath of the new materials to be found; (2) loss of mathematics teachers to the armed services; (3) swollen enrollments; and (4) the forcing of teachers with little or no experience and preparation into the mathematics departments. These facts were stressed at the institute and from them came some suggestions. The university faculties which were represented were challenged by the teachers and asked to carry out the solution of these problems in their summer sessions.

As this article goes to press, definite information is available from only two schools. Claremont is planning a summer conference and has asked for and will receive the coöperation of the Council. Stanford has requested the cooperation of the Council in setting up a workshop and conference. At present these plans are well on the way. While no definite information has reached us from UC and UCLA, it is to be expected that both institutions will repeat or give similar classes to those available during the past summer. The president of the Council will make every effort to be able to give information to those who request it.

IN asking for this editorial, the editor of the JOURNAL suggested that it might be well to tell you something of the activities of the mathematics teachers in the state. This we have tried to do; doubtless, however, much has been left unsaid that should have been said and undoubtedly there will be some parts that are not pertinent to your prob-

lems. All the California Mathematics Council desires to do is to help meet your problems; please do not hesitate to ask for help. And now it becomes my very great privilege to present to you Dr. Kinney and his corps of writers, who will give you in more detail the program which is being suggested for the schools of California.—RUTH G. SUMNER, *associate editor; Mathematics Department, Oakland High School.*

For Sale

A LIMITED number of copies of the April, 1943, JOURNAL, the issue including the symposium on "The Schools Organize to Harvest the Crops," are still available. This 50-page symposium consists of a report on school harvest activities in California during the 1942 season plus a series of recommendations and suggestions based on these experiences.

Probably more than ever before in the history of the secondary school, mathematics is in the spotlight today. Because industry and the armed services have not found enough people with the competency in this field that they demand, the schools have been the recipients of severe criticism. Usually overlooked in the heated discussions of how we have been teaching mathematics are certain points, namely, (1) it seems likely that the average boy or girl of a given age can use mathematics to better advantage today than could his father or mother, despite the rather general acceptance of the idea that our schools are neglecting the fundamentals, (2) that we are teaching mathematics today to all the children of all the people, whereas teachers of other years were faced with a relatively superior group of students, (3) that our objective in teaching mathematics to this large group has been to give them the skills they will need in their daily affairs, not the mathematics of war.

The schools have been too ready to accept the blame, when possibly they should go on the offensive and counteract criticisms as to what they have not done with statements of what they have done. It seems that the time is here for the schools to announce just what they are teaching and to justify their reasons for doing it instead of sitting back and defending themselves for not teaching everything that some one or other thinks they should be teaching.

This is not to say that our schools are without blame. Certainly there has been bad teaching in the mathematics classrooms. But the situation has been an unfortunate one indeed, for in the circle of recriminations and counter recriminations many mathematics teachers have lost sight of where they are going and have tended to blame anyone and everyone for directing them away from the formalism that characterized the teaching of mathematics for so many years. In their haste to find a scapegoat, they have hastened to place the blame on the modern emphasis on functional teaching, forgetting that the men and women who today are in the 18- to 38-year age group largely are the products of the teaching that preceded the age when Progressive Education is blamed for all our ills.

In view of this situation, the present symposium, "War-Time Mathematics in California Secondary Schools," should be of general interest. Organized by Acting Dean Lucien B. Kinney of the School of Education, Stanford University, it includes the following articles: "Meeting War-Time Demands for Mathematics," "Mathematics of Preflight Aeronautics," "Mathematics for the Armed Services," "Teaching the Mathematics of Industry," "Mathematics and the Home Front," "Advising Girls with Regard to Mathematics," "The California Subcommittee on Mathematics," and "Coöperative Reorganization of Mathematics."

Mrs. Ruth G. Sumner of Oakland High School, and an associate editor on the "Journal" staff, writes the editorial introduction. Mrs. Sumner is president of the new California Mathematics Council and also is California representative of the National Council of Teachers of Mathematics.

Meeting War-Time Demands For Mathematics

By DALE CARPENTER

ONE of the most important problems confronting secondary school administrators is that of finding ways to help every student develop his mathematical ability to the utmost. A distinct lack of mathematical training is evident in our young men who are being inducted into the armed forces. The same lack is apparent in the young men and women who are being employed in industry. The immediate, pressing need on the part of every student to obtain a maximum facility in mathematics can be met only by concerted and efficient action by mathematics teachers and school administrators.

The goal we must reach is the development of every individual to his maximum usefulness. The implication of such an objective, so far as mathematics is concerned, is simply that each student must receive a mathematical education which is adapted to his interests, ability, and the requirements of industry and the armed services.

Every mathematics curriculum must be planned with three major objectives in mind:

1. To give adequate mathematical training to those students who have the ability and aptitude to pursue the four-year sequence in mathematics.
2. To make sure that students of average ability or better are equipped with the basic elementary mathematical information and abilities which military authorities and industrial leaders have found to be essential.
3. To make sure that every student, including mathematics majors, has a good understanding of basic arithmetic and the ability to make practical and specific applications.

Considerable confusion exists in the minds of administrators and teachers as to how to meet effectively the war-time demands for more and better mathematical training. It is the opinion of the writer that many mathematics teachers feel the extreme urgency of the situation and are doing everything humanly possible to improve and extend their work. It is also true, however, that these same teachers are anxious to crystallize their thinking into an operative pattern to the extent that all administrators, counselors, and mathematics teachers will feel confident that their efforts are obtaining correct results. There is no complete, detailed

Mr. Carpenter's discussion of problems of reorganizing the mathematics curriculum is based on the curriculum work in this field he has been doing in Los Angeles as supervisor of mathematics in the Secondary Curriculum Section. As an important part of his duties, he has worked with mathematics teachers in planning the organization of courses, developing bibliographies of current materials, and improving methods of classroom instruction.

Mr. Carpenter has been closely associated with leaders in the army training program and with industrial personnel executives of the Southern California area during recent months, so he is in touch with the war-time needs for students trained in mathematics. He writes, "I have been particularly interested in organizing courses and material especially adapted to the students who are not academically inclined but who probably will be performing technical services in industry or the armed forces."

plan which will operate satisfactorily in every high school, and yet it is reasonable to believe that every school organization should be able to accomplish the three interrelated objectives as stated in the preceding paragraph.

The following plan is designed as a guide to aid teachers and administrators in planning a mathematics curriculum which will prepare every student to meet the mathematical requirements of total war.

A STATEMENT of specific mathematical areas, topics, and items is necessary in order to give meaning to to any mathematical curriculum planning. The following items have been selected as comprising information which is basic to military and industrial requirements. The selection was determined by analysis of War Department bulletins, by recommendations in current articles and recent texts, and with the aid of industrial and military leaders and mathematics teachers.

It must be understood that the following items are important because people must be able to use them. The material must be presented in its most practical and usable form if maximum value is to be derived from its teaching. These, then, are essential topics:

1. Common and decimal fractions and accurate measurements.
2. Percentage applications.
3. Tolerances and limits.
4. Areas and volumes.
5. Weights and measures.
6. Square root and Pythagorean theorem.
7. Metric equivalents.
8. Geographical or nautical mile.
9. Angles, geometric constructions, and relationships.
10. Scales, as applied to models, maps, drawings, and graphs.
11. Ratio and proportion.
12. Graphs.
13. Graphical or geometric solutions of area problems.
14. Vectors.
15. Positive and negative numbers.
16. Formulas, simple equations, and rectangular coördinates.
17. Speed, time, and distance relationships.
18. Fahrenheit and Centigrade transformations.
19. Electrical formulas and applications.
20. Formulas of force, work, energy, and power.
21. Latitude, longitude, and time.
22. Radians and mils.
23. Elementary strength and materials.
24. Center of gravity.
25. Elementary plane trigonometry.
26. Slide rule.
27. Logarithms.

With regard to the organization and conduct of standard mathematics courses in the United States, the following observations should be made:

1. Encourage qualified students to pursue four years of mathematics beginning with ninth grade algebra. Students electing to enroll in ninth grade algebra should meet the following conditions:

   a. Have good achievement in eighth grade arithmetic.

   b. Have reading ability of 8.5 or better.

   c. Have achievement of 8.5 in both computation and reasoning on a standardized arithmetic test.

2. Ninth grade students who are not qualified to elect algebra should enroll in an applied arithmetic course.

3. First year algebra and intermediate algebra should stress the use of graphs, vectors, and formulas as applied to mechanics, physics, and aeronautics.

4. Plane geometry should emphasize constructions, relationships, and facts, rather than formal proofs. Formulas and algebraic solutions of problems should be used extensively.

5. Plane trigonometry should stress applications to industry, artillery, navigation, and aeronautics and the extensive use of tables.

6. Spherical geometry should stress space concepts, map projections, and applications to navigation.

7. All courses should include brief systematic reviews of the essential elements of preceding courses.

8. Teachers must make sure that applications of the essential topics are studied and understood in connection with the regular mathematical content.

The war makes it necessary for us to step up the four-year mathematics sequence. Accelerating her courses, how-

ever, the teacher must have a clear-cut idea of the immediate objectives. Her aims must be defined in terms of use. Competency in mathematics means skill in using mathematical techniques when and where they count. Such competency requires clear understanding of operating principles and practice in the application and use of those principles. The instructor must provide problems of a type which serve to test the ability to perform real problems.

There must always be a plan of attack. Instruction must be clear, simple, and brief. We waste too many words. We must work for student understanding of essential and fundamental processes, using a variety of practical problems and insisting on good form, careful complete work, and 100 per cent accuracy. One good problem understood and worked correctly is worth 100 problems carelessly worked.

With regard to acceleration and streamlining of mathematics courses, the following cautions are offered:

1. Avoid spending excessive time on long, complex manipulations. Stick to essentials.

2. Make geometry a practical subject. Include solid mensuration with plane geometry. Limit the time spent on formal proofs decisively. Use problems and applications.

3. Condense intermediate algebra to one semester. Good students do not require as much review as usually is done in intermediate algebra.

4. Emphasize trigonometric functions, solution of triangles, and applications in plane geometry.

5. Emphasize spherical geometry and spherical trigonometry.

OBVIOUSLY only those students of real ability will follow the four-year sequence, but provision must be made for the great mass of our high school graduates to be mathematically literate.

The job of building complete mastery and understanding of basic arithmetic as used in practical problems is a major responsibility of every mathematics teacher. Good computational ability must be achieved and maintained, but to think of arithmetic efficiency only in terms of speed and accuracy with figures is a great mistake. Most of the essential topics can be approached through arithmetic, algebraic, and geometric aspects. A portion of the time allotted to every unit in either algebra or geometry should be used for systematic arithmetic drills and a study of the meaning of the processes involved.

Tenth, eleventh, and twelfth grade students not enrolled in the four-year sequence who fail to achieve a grade placement of approximately 8.0 on a comprehensive achievement test should be enrolled in a one-semester course of basic arithmetic. Students who do satisfactory work in the arithmetic course should be encouraged to enroll in the related technical mathematics.

The content of the basic arithmetic course should consist of the meaning of the fundamental processes and practice in applying fundamental operations in a variety of problems. Direct measurement should be used extensively. The course should not be limited to drill work, but should attempt to build understanding and meaning of processes as well as computational efficiency.

The average boy and girl has a very real need for a type of mathematical background which is not supplied by basic arithmetic nor the traditional four-year mathematics sequence. Teachers and students must get away from the idea that the present emergency and refresher courses are sops for those students who have a poor mathematical background but do not have sufficient time to pursue the traditional mathematics. Instead the idea should be established that courses other than the traditional type are needed to do a different job than that which the more academic mathematics is designed to

do. Any course which gives necessary mathematical background to students cannot be considered to be lacking in respectability.

What is needed is a two-semester course in related technical mathematics. The content of the course should consist of the essential topics listed in the opening paragraphs of this article. These essential topics are basic to both industrial and military requirements.

Students who probably will remain in school only one semester should be directed to enroll in the first semester of related technical mathematics instead of in algebra. Eleventh and twelfth grade students who have a reading ability and an arithmetic ability of at least 8.0 should be strongly urged to enroll.

EVERY teacher of mathematics has the opportunity of stimulating and helping every student in his class to perform a maximum service during the present emergency. It is the obligation of every mathematics teacher to make use of that opportunity.

Teachers frequently say, "I am ready to do anything which will help, but how can I be sure that I am doing the right thing?" Also the question is asked frequently, "Where are all these practical problems that are talked about?" To answer these questions of teachers, the following suggestions are offered:

First: All teachers need to be open-minded. They must search continually for better ways of doing things. Neither newness nor age is an infallible criterion for excellence. All of us can learn much from others.

Second: All teachers themselves must adapt materials and instructions to the students. No book ever has been written or will be written which will do this important job for the teacher. All material which has been included in a text is not necessarily good material. The teacher will need to select and improvise.

Third: Time is extremely important. Do not waste words. Get down to brass tacks. Use practical problems closely associated with the techniques and principles involved. Many people learn by seeing how something works.

Fourth: Make your meaning clear. Insist upon good English from yourself and from the class.

Fifth: Insist upon quality. Neatness, form, clarity, thoroughness, and accuracy result in work of superior quality.

Sixth: Understanding comes from doing a few things well—not from doing many things in a careless, meaningless manner.

Seventh: Plan your work and know your objectives. Select your objectives with great care, but once they are selected follow them through to completion. See that all instruction, every word, illustration, problem, and assignment, progresses toward a specific goal.

Eighth: Make sure of fundamentals and of your students' ability to use them.

Ninth: Be practical. Remember the incident of the Greek philosopher who when asked, "But of what use is geometry?" replied, "Thank God it has no use." Times have changed. It is foolish to ask a boy to prove that only one perpendicular line can be drawn from a point to a line. Probably he has demonstrated it many times already on the drafting board. It is more important that a student can make one application of a mathematical fact than that he be able to prove all of Euclid's theorems.

Tenth: Contact industrial and technical teachers and workers. Learn from them. Become familiar with elementary shop information. When a mathematics teacher presents a mathematical principle, he should be able to say where and how it is used. Mathematics teachers should know properties of materials and shop formulas, including electrical formulas.

Eleventh: Know your students, their

abilities and interests. Do not make the mistake of blaming former teachers. It is always surprising what a student can do when he wants to do it. Your job is to make him "want to get results." The writer knows personally a young man who is soon to get his wings in the Naval Air Corps. He has turned in an outstanding performance all through his training. He already has received official recognition on account of his exceptional ability. However, he was a failure in high school mathematics. But to add insult to injury, he made a perfect score in his celestial navigation test. The writer does not intend to infer that good training in mathematics is not valuable; yet, with some others who have been analyzing the problems of teaching, he would like to ask, "What mathematics?"

Twelfth: Study materials in the fields of aviation and industrial mathematics and navigation. They are interesting and educational and will prove invaluable aids in promoting class interest and work.

WITH regard to the secondary school mathematics program, we in the schools have certain responsibilities. Some of the more important of these are as follows:

Mathematics teachers have the responsibility of (1) keeping all of their instruction as interesting and practical as possible, (2) making sure that essential topics and applications are included in all mathematics classes where appropriate, (3) providing for improvement in basic fundamentals in all mathematics classes, (4) coöperating as a school unit in order to plan the most effective mathematics program, (5) keeping on their toes and becoming familiar with the applications of mathematics in all phases of industrial and technical work.

Counselors must be familiar with the capabilities and interests of students and know how such capabilities and interests can be developed to the best advantage in the mathematics program as a whole. They should recognize the fact that there are mathematical skills and procedures suited to the abilities and interests of every boy and girl. Many students who are not adapted to the four-year sequence will succeed in mathematics which is more suited to their immediate needs.

Counselors should encourage qualified girls to pursue mathematical courses on the same basis as boys. A large percentage of the employees in war production plants are women, and many of the technical jobs are being filled by women. Girls have the same opportunities as boys in scientific and industrial research. A mathematical curriculum which is designed to meet industrial, scientific, and military requirements will be just as suitable for girls as for boys.

Administrators are charged with the responsibility of coöperating with the mathematics teachers in providing a comprehensive, flexible mathematics curriculum which will meet the requirements of all students. The pattern of courses will vary to some extent in all schools due to differences in the teaching staff, abilities of students, and school locations. Small high schools will find it difficult to establish a varied program, and there the individual teacher will have the major responsibility of providing a diversified program within the framework of her regular classes.

Mathematics of Preflight Aeronautics

By CORNELIUS H. SIEMENS

In the January issue of the "Journal" was published a symposium on preflight training in California schools, planned by the author of this present article. That symposium was so well received that the issue in which it was contained was sold out within a few days after its appearance. Undoubtedly, therefore, Dr. Siemens' present article on the mathematics of preflight aviation will be one of the most popular of the current symposium.

Dr. Siemens is assistant professor of secondary education at the University of California, Berkeley. He spends a great portion of his time visiting schools over the State in behalf of the Civil Aeronautics Administration and, under CAA auspices, is available to consult with aeronautics teachers or to speak to faculty groups. He is the author of the "Aeronautics Workbook," published recently by Ginn and Company.

UNPRECEDENTED in the development of the secondary school curriculum has been the incredible rise in the number of high schools offering a course in the science of aeronautics. Just one year ago, the Civil Aeronautics Administration joined with the U. S. Office of Education in launching the aviation education program in the schools. The program has had as its immediate aim the establishment in the high schools of at least a one-year course in preflight aeronautics available to every able boy and girl.

Not only will such a course prepare prospective aviation cadets for further training in the armed forces, but also it is the beginning of an aviation education program in our schools, a necessary training of youth for the future development of the air age. Just as the airplane has revolutionized warfare, the use of the airplane will bring about fundamental changes in our social, economic, and political way of living and thinking. It is imperative that our nation prepare its youth to participate intelligently and effectively in the air age of tomorrow.

Over two-thirds of the high schools in California are now offering at least one course in the science of aeronautics; another one-sixth are including separate phases of aeronautics in mathematics or in science courses, such as a unit on meteorology in general science or a unit on navigation in plane geometry.

PREFLIGHT aeronautics is essentially an applied science course encompassing basically the fundamental elements of aerodynamics (the principles of flight: lift, drag, et cetera), meteorology (the weather and its behavior), and air navigation (how to get from here to there). The nature and extent of the mathematical content and processes required by each of these three basic units differ so greatly that the algebra, geometry, and trigonometry of aeronautics will be discussed separately.

The algebra required by a one-year high school course in preflight aeronautics can be exemplified by one relationship from aerodynamics, namely, the formula for lift, $L = C_L \frac{\rho}{2} SV^2$.

If the student can solve the lift formula for each of the variables, express and solve the relationships between any pair of the variables when the other factors are held constant, and substitute numerical values and perform the resultant arithmetical operations correctly, he will have demonstrated, in the main, the ability required for the mathematical understanding and treatment of aeronautics problems involving algebra.

The above operations include, of course, such concomitant skills as reading values from a graph or table, finding the square and square root of a number by means of a table, and manipulating numbers as large as 10^7, as small as 10^{-6}, and with five significant places. One formula for horsepower which is similar to the one for lift cited above includes a cube factor, necessitating the ability to find the cube and perhaps the cube root of a number.

Algebra is used chiefly in aerodynamics, only rarely in meteorology or navigation. Problems involving algebra call for substituting numerical values and calculating the answer, solving equations including squared terms (none with two terms in the same variable, however), expressing and solving relationships that vary "directly," "indirectly," "with the square of" and "with the square root of," and understanding the derivations of formulas which involve adding equations or substituting an algebraic expression into a formula in the place of a single letter.

Aeronautics uses many geometry skills and applications. Aerodynamics and navigation use the vector representation and depend on solving numerous problems by means of the vector triangle and the parallelogram of forces.

This procedure requires that the student be able to lay off distances with a metric ruler and a compass, scale distances by means of a ruler or by using the scale printed on the edge of the map, lay off and measure angles accurately to one degree (using the north reference line), draw neat triangles to scale, construct perpendiculars, bisect line segments, and divide a segment into a given number of equal parts.

Most important in all these skills as well as in many other computations is the fact that in practice the operations must be performed *quickly* and *accurately* (within limits of tolerance). An answer to a navigation problem that is "too little or too late" is quite likely to jeopardize the lives of the pilot and his crew, as well as to cause the loss of the plane. An error of as much as two degrees in plotting a course could result in an error of 20 miles in a 600-mile flight, and a "flat-top" cannot be seen that far in a haze or at night. The time and accuracy element in mathematics takes on a new meaning when death and failure depend on an erroneous or belated wind correction angle, a misplaced decimal, or a misread vernier.

The place of trigonometry in high school aeronautics is difficult to define. For a one-year course in preflight aeronautics, trigonometry is not essential; it is a convenient tool, however, and lends itself nicely to several problems in aerodynamics. Certainly capable students should take it for future use, but trigonometry cannot be justified as a necessary prerequisite to preflight aeronautics. Some teachers have found it easily possible to teach the better students sufficient trigonometry in the aeronautics course itself. By "sufficient" is meant the application of the six basic trigonometric functions to the right triangle. The course in trigonometry, however, can gain much from the excellent and interesting applied problems that can be drawn from such situations as measuring the height of a cloud base and determining the angle of bank from the plane's weight, speed, and radius of turn.

THE teacher of the traditional subjects of algebra and geometry might ask, "Am I not already teaching most of the mathematics necessary for the successful study of aeronautics?" The answer can be given best by citing an incident. An aviation cadet was asked, "Doesn't your high school math help you work these aerodynamics problems?" His answer, packed with implications, was, "Not very much, because, you see, this is a different kind of mathematics."

Scientific studies verified by common experience have shown that we cannot expect mathematical skills developed in a vacuum to persist, much less to be applied to practical problems removed from the mathematics classroom. We must make the transfer of learning possible by embodying the skeleton of mathematics in the meat of problems and situations in which the mathematics will likely function. There should be, perhaps, as much aeronautics in mathematics as there is mathematics in aeronautics. The benefits would be reciprocal; courses in mathematics would be greatly enlivened by the addition of up-to-date problems realistically solved, and the teacher of aeronautics would not need to stop each time a mathematical tool was utilized to explain its use, perhaps even to reintroduce it, the tool and its use having been long forgotten.

It is not so much a matter of adding aviation content to algebra and geometry as it is a matter of changing the manner in which mathematical skills are developed within the student. One teacher expressed the idea by remarking, "I find aeronautics an excellent vehicle by which to teach the fundamentals of geometry." By means of clarifying a situation or solving a problem, she was able to present the fundamentals of geometry in a functional manner. More formal geometry and algebraic gymnastics are not the answers to the student's need for a practical, functional foundation in mathematics.

In summary, then, it seems better to make constant applications in a mathematics course to a single area of applied science such as aeronautics than to make none at all or to introduce only hypothetical and valueless illustrations. The keen interest of the students in a new and permanent field of scientific development does much to generate the motivation necessary for them to study the more abstract and difficult subject of mathematics. Never before have teachers had the opportunity to work with such a combination of a general interest, a powerful motivation, and a practical field of mathematical applications. It behooves every teacher to capitalize on these natural, or at least circumstantial, psychological forces with the objective to present the offerings of mathematics in the most functional and interesting way possible.

AS it becomes known what mathematical knowledge, skills, and abilities are necessary for the successful study of preflight aeronautics, there follows the question, "What courses shall be listed as prerequisites, or shall new mathematics courses be added, or both?" The answer is not a simple one nor can one program be recommended for all high schools.

Let us analyze the present mathematical training of the students who have a genuine interest in aviation and who possess the minimum ability to profit from aviation training, preflight or otherwise. In the main, the background training divides eleventh and twelfth-grade students into three groups as follows:

1. The group that is following a college-preparatory curriculum which includes at least one year of geometry and one year of algebra; many in this group have taken a second

year of algebra, and some plan to take trigonometry and solid geometry.

2. The group that is capable of taking two or three years of mathematics but which, for a variety of reasons, "missed the boat." These students have taken less than two years of mathematics, electing to take no more than was required for graduation or as course prerequisites. These do not intend to go on to college; most of them likely will attend junior college or some post-high-school trade or industrial school.

3. The group that by reason of "trial and failure" or prognostic test results is unable to "take" college preparatory geometry and algebra. Many of these have taken a course such as "shop math," "general math," and the like.

THE boys and girls in Group 1 have the requisite mathematics for a course in aeronautics and should have little difficulty if the aviation teacher takes time to make the necessary tie-up between "pure" and "applied" mathematics. The teachers of mathematics can help greatly with the teaching of aeronautics by preparing these students for such applications.

Ample illustrative and problem materials are available in a variety of "aviation mathematics" books, recently published for this purpose [2-5, 9-11].[1] Perhaps the three references containing the greatest amount of aeronautical mathematics are the ones prepared by or for the War Department [11], the U. S. Navy [9], and the Civil Aeronautics Administration [5]. Numerous problems and applications to aviation are included in the 1942 Yearbook of the National Council of Teachers of Mathematics [8]. Such books should be used as references and source books to supplement the regular text.

Aside from the "mathematics in aviation" books, the teacher is urged strongly to go directly to one or more of the aeronautics texts [1, 6]. Here one will quickly find mathematics in its aviation setting and will find it possible to become acquainted first-hand with the mathematics required and at the same time to become familiar with the subject matter context. An aeronautics workbook [7] includes review tests in arithmetic, algebra, and geometry, practical problems, and a full-sized aeronautical chart, which makes possible interesting practice in various applied skills of geometry.

With the introduction of such materials, the regular college preparatory courses will prepare the Group 1 students for preflight aeronautics and for future aviation training; the courses also will take on a functional aspect long needed and desired.

GROUP 2 has been estimated to be composed of about one and one-half million boys and girls in the eleventh and twelfth grades alone. It constitutes the most promising pool for meeting the needs of an ever-increasing air force. The military aviation personnel requirements for 1943 alone have been set at 2,200,000, with a proposed ultimate size in excess of 4,000,000. But having missed the opportunity to take geometry and algebra, what can these youths do?

One feasible solution is found in a recommendation by the Coöperative Committee on Science Teaching.[2] The Committee strongly urges that high schools provide immediately for this group a special "Emergency Course in Mathematics" which would include those elements of arithmetic, geometry, algebra, and trigonometry, which are essential to "open the doors to many opportunities in war activities." For the duration, or as long as the need exists, such a course should be estab-

[1] Numbers in the text enclosed in brackets refer to titles in the bibliography.

[2] Robert J. Havighurst and others, "High School Science and Mathematics in Relation to the Manpower Problems." *School Science and Mathematics*, Vol. 43, No. 2, p. 127, 157, February, 1943.

lished to provide the opportunity for every capable boy and girl to obtain the mathematical background for the preflight aeronautics course. Some schools have organized "aeromath," "preflight mathematics," and "aviation mathematics" courses to meet this special need; others are planning a two-year aeronautics course in which the first portion will be devoted to the development of the requisite mathematical skills.

The need for trained personnel is such that a high school cannot eliminate capable students from aviation training just because they failed to take certain courses in the past. A program must be provided which will offer the best training possible with the student material and time at hand.

THE students comprising Group 3, those who are interested in aviation education but who are limited in mathematical ability and training, present a special problem in vocational guidance. Many of these students are needed and will be able to find a place in one of the aviation ground occupations; others will learn how to fly as civilians. Again, the school should react to the needs of this group and provide training commensurate with their abilities.

Larger schools are organizing aviation shop courses in design, construction, maintenance, engines, and aerial photography. Basic skills in arithmetic, graph reading, scale drawing, map reading, measurement, and use of simple formulas are developed in mathematics courses variously designated as "applied," "general," and "industrial" mathematics. In the smaller schools, these students may have to be combined with Group 2 in an "Emergency Mathematics" course.

The important thing is that the most functional training possible be provided for every student. Many a boy's life in less than a year after he leaves the high school will depend on the training he has received. In this sense, all high school training for the boys is a preinduction program. Never has there been such a premium placed on practical administration and functional teaching.

BIBLIOGRAPHY

1. Aviation Education Research Group, Teachers College, Columbia University, *Science of Preflight Aeronautics for the High Schools.* The Macmillan Company, 1942.

2. Buchan, A. F., R. Borthwick, and W. R. Wadden, *Aviation Mathematics.* Houghton Mifflin Company, 1942.

3. Downer, A. E., *Practical Mathematics of Aviation.* Pitman Publishing Corporation, 1939.

4. Naidich, James, *Mathematics for the Aviation Trades.* McGraw-Hill Book Company, Inc., 1942.

5. Osteyee, George, *Mathematics in Aviation.* The Macmillan Company, 1942.

6. Pope, Francis, and A. S. Otis, *Elements of Aeronautics.* World Book Company, 1941.

7. Siemens, Cornelius H., *Aeronautics Workbook* (complete with aeronautics study chart), Ginn and Company, 1942.

8. *A Source Book of Mathematical Applications.* Seventeenth Yearbook of the National Council of Teachers of Mathematics, Bureau of Publications, Teachers College, Columbia University, 1942.

9. U. S. Navy, Bureau of Aeronautics (under supervision of the training Division), *Mathematics for Pilots.* McGraw-Hill Book Company, Inc., 1943.

10. Walling, S. A., and J. C. Hill, *Aircraft Mathematics.* The Macmillan Company, 1943.

11. War Department, *Mathematics for Pilot Trainees.* TM 1-900, U. S. Printing Office, Washington, D. C., 1942.

12. Coöperative Committee on Science Teaching, "High School Science and Mathematics in Relation to the Manpower Problem." *School Science and Mathematics,* 43:127-157, February, 1943.

13. "Pre-induction Courses in Mathematics." *Education for Victory,* Vol. 1, No. 27, p. 12-17, April 1, 1943.

Mathematics for the Armed Services

By CHRISTOPHER A. CONNOR

Two important questions—what mathematics do the armed services want us to teach our boys in school? and what type of problems should we use?—are answered in this article. Mathematics teachers should be particularly pleased to hear of the proposed coöperative formulation of problems dealing with army and navy tactical situations.

Mr. Connor, who writes the article, is an instructor in mathematics at Menlo School and Junior College, where he has been since 1933. He is a graduate in engineering from Harvard and has an M. A. degree from Stanford in education. He served in World War I and has been an officer in the Corps of Engineers Reserve since then, now being a captain in the inactive Reserve. He has taught mathematics in New York and California for over twenty years.

ANY man who has been trained by the United States Army for a position of leadership and responsibility—from corporal to general—has, very early in his army training, had to learn the technique known as the "Estimate of the Situation." Intended to insure that the leader will follow a definite and logical process of thought in arriving at a decision as to the course of action he will follow, the sequence, reduced to its simplest terms, covers the answers to five questions:

1. What do I have to accomplish?
2. What may prevent my doing it?
3. What is available for overcoming those obstacles.
4. What plans are open to me, with the advantages and disadvantages of each?
5. What method shall I use?

A complete estimate of the situation confronting the teacher of secondary mathematics in attempting to see to it that boys entering the armed services are equipped with the necessary competence is not feasible here. It will be useful, however, to point out some of the factors involved in the choice of a course of action.

THERE is no question but that the schools must recognize the need for mathematical competence in those entering the armed forces. Evidence on this point is quite adequate.[1] The question is how best to adjust our mathematics program to this end. This brings us face to face immediately with our problem: what mathematics is needed? While there have been many statements in the literature,[2] two of particular interest were presented at the "Institute on Mathematics in the Emergency" held at Stanford last December.

The first, a statement of the mathematics needed by armored forces in particular,[3] is as follows:

1. Arithmetic.
   a. Computations, whole numbers, decimals, fractions.
   b. Problem solving.

1 Summarized, for example, by L. B. Kinney, "The Reorganization of Mathematics for the Emergency," *The Mathematics Teacher*, 36: 3-10, January, 1943.

2 In particular, see W. L. Hart, "Progress Report of the Subcommittee on Education for Service of the American Mathematical Society and Mathematics Association of America, *The Mathematics Teacher*, 34:279-304, November, 1941.

3 By Colonel B. S. Shute, Corps of Engineers, United States Army.

c. Measurements, both English and metric systems.
d. Ratio and proportion.
e. Powers and square roots.
f. Percentage.

2. Algebra.
a. Solution of simple formulas.
b. Simple equations.
c. Graphs.
d. Use of tables, including interpolation.

3. Geometry.
a. Use of the protractor.
b. Use of geometric constructions in making scales for maps.
c. Reading maps and drawings.
d. Areas and volumes.

The second applies particularly to the Navy.[4] Under the head of preinduction mathematics are classified the following:

a. Drill in the fundamental arithmetical processes of addition and subtraction until real skill has been attained.
b. Study of plane geometry, with the purpose of enabling the student to apply geometrical concepts to practical situations. Problems should be drawn especially from aviation, navigation, and mechanized warfare.
c. Development of the power of the student to reason mathematically. Practical application of simple equations.
d. Study of graphs, and how to plot and interpret them.

In addition, we find listed under the heading of "physics" the following:

a. Mechanical drawing; blueprint reading, including reading of graphs, drawings, plates, and charts.
b. A thorough knowledge of both English and metric systems of measurement.

Thus, these two service representatives agree in general as to *what* mathematics is needed. A study of their recommendations indicates that they expect us to teach the fundamentals—of arithmetic, simple algebra, and plane geometry. However, several processes and skills which many of us have considered advanced applications, rather than fundamentals, are included on the lists. Important among these is skill in securing data from tables or from graphs, including interpolation in both cases, and the application of geometry to the reading of maps and charts. It is unsafe, therefore, to assume that the army and navy want us to teach elementary fundamentals and will do the rest of the job themselves in teaching the applications.

Further study of the recommendations reveals an emphasis by both officers on problem solving. The development of ability to solve problems systematically is still another desired outcome which, in too many cases, we have hoped to secure without sufficient instruction and practice. The army "estimate of the situation" is in itself simply a systematic method of attacking a problem to be solved; anything like it will be an outcome of the course in geometry, for example, only if conscious attention is placed on its development. Little or no motivation will result if we set up purely artificial situations and then attempt to tell the student that he will need to use the same or similar techniques in solving problems in the armed services.

THE problems that we introduce may be of two types, depending on the purposes for which we use them. Some problems will be needed to develop competence in certain mathematical processes, which are later to be applied in new situations. The problems themselves may be drawn from local situations in the immediate environment of the pupil, although the pupil is expected to use the mathematical process later in applications which are secret or difficult to visualize. Thus, in geometry we have such processes as these:

1. To solve a triangle, given two angles and the included side. This is important in range finding, airplane direction, mapping, and other military applications. Much field work,

[4] By Commander F. B. Melendy, United States Navy.

using scale drawings, similar triangles, and trigonometric functions can be utilized in the development of ability to use the process.

2. To use instruments for geometric applications. A great variety of instruments are used for special purposes, all having the common function of measuring angles. Experience has shown that outdoor use of a homemade transit gives a better understanding of this than practice with complicated transits or sextants. A great amount of this sort of work should be planned.[5]

It is clear that this list could be extended to include many of the processes listed previously. The problem is to identify the processes needed and to find significant applications that can be appreciated by the pupil.

IN a second type of problem, the applications to be used are those for which the process is being learned. This is the most efficient type of problem. It requires a great amount of effort, however, to collect genuine applications. The following list contains a few.

1. You, Corporal X, are out on a reconnaissance in a "jeep." You have a printed map from which the scale has been torn off. You identify a church and a railroad crossing on the same straight road, both on the map and on the ground. The distance between the two points from your speedometer is just under 0.7 mile. On the map the same distance measures 11/32 of an inch. What is the probable scale of the map?

2. You are a sergeant in charge of a small truck convoy ordered to proceed from town X to town Y on the North African Coast. The only map you have available is a French map of scale 1cm. = 1km., with a vertical contour interval of 10 meters. The distance from point A where one contour crosses the road to point B where the next crosses measures 3 cm. on the map. What is the gradient from A to B in feet per mile? (1 meter = 3.28 ft.)

3. You are the commander of a small escort vessel with a convoy. The convoy is sailing along parallel 57° N. The distance travelled, in nautical miles, along any parallel of latitude may be found in minutes of longitude from the formula: Diff. in Long. (in minutes) = Dist. in N. M. x secant of Latitude. Find the change in longitude if your ship travels due west at 12.5 knots for 12 hours.

4. Same general situation as in No. 3. You are taking an observation on a star and desire to know the correct local time. If you determine from your chronometer that it is 11 hr. 20 min. 10 sec. at Greenwich, what is the correct local time at long. 148° 20′ W.?

5. You are at the helm of a mine sweeper coming back from patrol and approaching an Aleutian base in a fog. You sound your foghorn. There is an echo of the foghorn reflected from high cliffs on the coast of the island. If this echo is heard 27.6 seconds after the note is blown, how many miles off shore are you? Sound travels at 1,090 feet per second.

6. You, Sergeant B., are sent on a reconnaissance mission down a river. You are given an outboard motor boat and told that it is capable of 12 knots in still water and has a fuel capacity of 10 hours at that speed. At 9:30 a. m. you set off down the river aided by a 3-knot current. At what time must you turn back to return to your base?

7. Your battalion leaves a town in a truck convoy at 1:00 p. m. You, Corporal T., are left behind to pick up some special supplies, with orders to leave as soon as you get them and catch up with the convoy as soon as possible, but not to exceed a speed of 35 miles an hour. If the convoy travels at a rate of 25 miles an hour and you leave town at 1:30 p. m., at what time will you catch up with it and after how many miles?

8. You are Private First Class B., in charge of a barrage balloon. The balloon has 600 yards of mooring wire out, but 3 per cent of this represents curvature. The balloon is vertically overhead at a place 100 yards from its mooring anchor. At what altitude is the balloon flying?

The final question is: where can the secondary teacher secure service problems, or learn enough about what the services are doing to set up typical service problem situations? The teacher should most certainly have in his personal library a good selection of the most modern texts; he will find each a splendid source of ideas from which he can develop problems. Any textbook used should be supplemented by special problems, and the type of supplemental problems which are most needed must

[5] C. N. Shuster and F. L. Bedford, *Field Work in Mathematics*, American Book Com-Company, 1935.

be drawn from army and navy sources—and bear either official or semi-official approval, if they are to carry the weight in the student's estimation that they should. The services will coöperate, and in many cases have coöperated, to the extent of providing typical problems; where they won't, perseverance and tact will eventually wear down the barriers of "restricted material" and "military secrets," unless these prohibitions are genuinely justified. A list of some of the sources which have been found useful is given at the end of this article.

One thing stands out above all others; a tremendous amount of work has to be done, particularly in taking "typical" service problems, studying the principles underlying them, and compiling a large number of problems, of wide variety, for use at various levels in the schools. While much of this sort of work has been done and is being done by individual teachers, the task really demands coöperative effort.

Two of the most promising movements along this line are those sponsored by the California Mathematics Council. The first, already under way, calls for the Council, through its executive secretary, to serve as a clearing house for ideas, problem materials, and teaching problems; through this agency we can pool the results of individual effort. The second is the proposed workshop to be held this summer at Stanford; the work done in it will be of great value to those teachers who take part and, if the results can be made available to those who are unable to attend, will be of inestimable assistance to all of us in contributing to better and more functional teaching of mathematics for the emergency—and after.

A BRIEF list of source material which has been found most useful, omitting for the most part the better known textbooks, and to be considered as suggestive rather than inclusive, is appended herewith:

1. *Fifty Typical Problems in Mathematics and Physics, Supplement to a Wartime Program in Mathematics and Physics,* Florida State Department of Education. (Address inquiries to the attention of Paul Eddy, editor, Tallahassee, Florida.)

2. *Mathematics Essentials for the War Effort,* Bulletin No. 40, State Department of Education, Tallahassee, Florida, September, 1942.

3. *Refresher Course in Fundamental Mathematics, ibid* (may be secured from U. S. Naval Institute, Annapolis, Maryland). Modeled on this is the publication, *Wartime Refresher Course in Fundamental Mathematics,* by Eddy and others, published by Prentice-Hall. The official Navy publication gives references to sections of Nelson M. Cooke's *Mathematics for Electricians and Radiomen,* published by McGraw-Hill in 1942, which is a very fine source of problems for this group of specialists.

4. *Some Military Applications of Elementary Mathematics,* The Institute of Military Studies, The University of Chicago, Illinois.

5. *A Source Book of Mathematical Applications, Seventeenth Yearbook of the National Council of Teachers of Mathematics,* Bureau of Publications, Teachers College, Columbia University, New York, 1942.

6. *Teaching Aids, Sample Problems, and Sample Examinations Taken from Courses Being Taught at Naval Training Schools and Aviation Bases,* Training Division, Bureau of Naval Personnel, Navy Department, Washington, D. C.

7. The group of five typical problems presented by Colonel Shute at the "Institute on Mathematics" held at Stanford last December and published in the first *Bulletin* of the California Mathematics Council. These are based on the tables and formulas in *F. M. 5-35, Engineer Field Manual, Reference Data.* Similar problems in great number could be developed by use of this manual and the field manuals of other branches of the Army, as well as similar Navy publications.

8. Excellent source material for other branches of the armed service can be found in many of the books on "aviation mathematics" which have been published recently—particularly the problems on navigation, gunnery, drift, and relative speeds and the many formulas which have wide application.

Teaching the Mathematics of Industry

By E. P. VAN LEUVEN

What is the best method for teaching the student the mathematics he will need as a factory worker or as a semiskilled worker? This is the question that Mr. Van Leuven answers in his article, illustrating his discussion with a description of the procedure followed in the Kern County Union High School. The writer is very familiar with this whole problem of mathematics for industry, being the author of "General Trade Mathematics," a text based on the results of a two-year survey of mathematics training for shop students over the United States and on the syllabus which he used at Bakersfield during his ten years of teaching trade mathematics.

Mr. Van Leuven is a shop instructor in the Department of Mechanical Arts in the Kern County Union High School and Junior College, Bakersfield. He has had twenty years of teaching experience and has worked at three trades long enough to become a journeyman in each. He has written two texts, the one on mathematics mentioned above, and "Cold Metal Working."

THE unusual demand for skilled and semiskilled workers, brought about by the War Production effort, has presented a situation which might lead many to believe that some of our school training hitherto has been inadequate. This seems especially true in the trade related field of mathematics. The lack of a general spread of sound and practical experience in mathematics is very evident to the instructors now engaged in training adult factory workers, national defense trainees, or members of the armed forces for some branch of mechanical work.

Our National Defense Training program has been in operation about two years. Those who entered this field early were generally the most adept. Many came from closely related fields where there could be considerable carry-over of their experience and training. To some extent these individuals had used mathematics in following their chosen occupations. Now it becomes more difficult to find trainees with any practical mechanical experience or who have ever used the mathematics they once studied in school. Many seem unable to apply simple arithmetic to their present needs.

The mechanical training being given members of the armed forces reaches a group younger than those recruited for industry. Many of these are of school age and should possess knowledge too recently acquired to be so soon forgotten. Yet even in this training it has been found that practically all must be taught or retaught the fundamentals of arithmetic before there can be any practical application of these in their training.

While an understanding of algebra and geometry are desirable in complete trade and industrial training, the great bulk of calculations for the semiskilled mechanic and factory worker must be of an arithmetical nature. Algebra may be of some use to the lead man, tool and die maker, and supervisor. These workers need to understand formulas and how to use them in avoiding the more

tedious operations with numbers. Likewise, the elements of trigonometry may be used to a limited extent in the shop. In taper turning, template making, determination of stock, and so on, trigonometry is useful, although in most cases not absolutely essential. Much of this work involving trigonometry, however, will be executed in the engineering department and usually is not included in the training for factory workers except when given as further training after employment advancement.

AS an example of the mathematics that schools are finding it necessary to give future factory workers and semi-skilled workers, let us cite an illustration from our own school. In our shops, at the Kern County Union High School and Bakersfield Junior College, training is being given to sheet metal and subassembly workers for a large aircraft company. During this training the trainees are on the company pay roll and receive the minimum wage for the industry while learning. The course runs for ninety-six hours in a two-week period. Our teachers and the company supervisors find it necessary to devote 5 per cent to 10 per cent of this time to the fundamental operations of arithmetic—addition, subtraction, multiplication, and division of whole numbers, common fractions, and decimal fractions.

Practically none of these trainees has had practice in using a rule graduated in 64ths or 100ths of an inch. All must learn anew or relearn how to change common fractions to decimal fractions and how to change decimal fractions to common fractions. All must be able to divide a given space into equal parts of an inch and express the results in 64ths or decimals. All must be taught how to read a micrometer and how to lay out angles. For these aircraft factory trainees, this is the extent of the mathematical brushup the company requires, and it has proved sufficient for beginners in the industry.

It may be argued that reading the rule, the micrometer, and other measuring tools should be a part of shop training rather than mathematical training. Perhaps the learner should learn to read the vernier protractor in the shop the same as he learns to operate a lathe or use a hacksaw. But since the use of measuring tools usually involves computations and their correct use is dependent on exact computing, the interrelation of the two departments should be clear. Most trainees show a knowledge of indirect measurement, but for them direct measurement instruction which uses actual measuring equipment generally has been neglected.

Our school also is training seventy-five regularly enrolled junior college and graduating senior high school girls in a 180-hour course called "Defense Mechanics." Some of these girls also are taking a ninety-hour course in mechanical drawing. Two large aircraft companies, which have had their officials look over our program, declare these students will be 100 per cent employable and each will place all we recommend.

Most of the girls in Defense Mechanics have passed the examination called Arithmetic X, a review and application of arithmetic fundamentals, which all students of the Kern County Union High Schools must pass before graduation; and we find it not difficult for them to complete the work planned to meet the minimum aircraft factory requirements. Their knowledge of general arithmetic is good, and it is only necessary to give them experience in the use of the tools already mentioned, which we do as shop training, and to let them practice their mathematics on

shop problems taken from the factory work we are simulating.

SURVEYS show that high school pupils generally do not compute accurately and are not grounded in simple reckonings. This is due, perhaps, in many cases to promotion because of age rather than because of subject knowledge. But whatever the reason for this deficiency, an attempt must be made to recognize the fact that pupils reaching high school have not had sufficient training in the fundamentals of arithmetic and are ill-prepared to take up abstract mathematics, which usually is given as college preparatory work. And since the great majority will be absorbed in mechanics and industry, the traditional mathematics courses are not suited to them.

In the past, and it may be assumed for the future, many who enter the trades will have minimum aptitude, and for these both the quality and quantity of training must be geared to needs and ability. On the other hand, there are larger numbers of more adept students now selecting trade and industrial training for career work, and these deserve just consideration. They should become the leaders in the trades. Since there is so much diversity of aptitude and ability among student artisans, the training must be organized so that each may proceed at his own level of achievement and at his own best pace. Shop practice allows the individual to proceed as rapidly as he can, and there is no good reason to establish a class procedure in trade mathematics courses which holds a group of varying aptitude and attitude to formal classroom methods.

Naturally, the teacher will have a more difficult task when he teaches shop mathematics like a shop subject than if he teaches it in a more formal manner. The assignment of a page or a lesson a day is not good shop practice. A definite minimum course of instruction should be outlined and presented in such form that the ambitious and able can complete it without delay and receive the credit the school allows. Of course, if only the minimum of work is done, only the minimum grade should be given. Advancement should be on the basis of acquisition of definite skills, whether they be shop practice or related information. Instructional material should be so planned that the lessons build on the foundations of preceding ones.

The shop mathematics classroom should be equipped with all layout and measuring tools and equipment used in the shop, unless this equipment can be carried from the shop to the classroom, or unless the shop is used as the mathematics classroom. Likewise, there should be a close tie-up between the mathematics classroom and all of the shops. It is easy to teach board measure, for example, if students actually have the opportunity to measure lumber.

The trade mathematics classroom should be equipped somewhat in the manner of a physics laboratory. Surely, if physics, a college preparatory subject, taught to those of most aptitude, requires demonstration equipment, it is presuming too much to expect trade mathematics and its applications to be learned from discussion only, by a group generally of much less aptitude. An ideal situation places the classroom near the shop from which equipment can be borrowed or to which students can be taken to study the problem at hand.

Finally, the teacher should be able to use and demonstrate the principles and equipment being studied.

IT may be assumed generally that the great bulk of the students who go into industry will have little or no formal mathematical training after they leave high school. With many of these,

especially during the war emergency, this will be after two or three years of high school. To begin with, prevocational mathematics, mostly arithmetic, should be given these workers in the ninth or tenth grade, when the students are taking their exploratory shop courses or their preliminary trade training. In this training, the boy's mathematics should be related closely to his shop work. In the senior high school, trade-related mathematics must have problems selected from actual shop situations.

When a general trade mathematics course is given, it should supply the training needed for the solution of shop problems met in the occupations generally classified as manufacturing and mechanical and for the trades of automobile mechanic, airplane mechanic, cabinet maker, carpenter, electrician, sheet metal worker, and welder.

For some of the trades, such as carpenter, layout man, loft man, and so on, geometric construction and applied geometry must be presented with the view of simplifying mathematical training and tying it to the job in the shop. As already stated, those who may advance to supervisorial positions will find a need for elementary trigonometry. Since there are definite shop applications for trigonometry, it is right to expect the shop teacher or the trade related instructor to see that this work is presented when occasions arise for all who can absorb it.

The aim should be to present in the simplest and most understandable manner those principles and applications of arithmetic, algebra, geometry, and trigonometry that have been found useful to the ordinary craftsman. But most important of all for industrial training it is necessary to supply additional if not complete drill in ordinary arithmetic. This instruction, even though elementary, must be precise in presentation and of sufficient interest to attract the average worker. Training should supply practical computations based on the learner's observations as well as on those facts he must know for his trade so that not only will he be given more assurance in figuring but so that his interests will be aroused in such work. His classwork should help the student to develop logical reasoning and should enable him to analyze his own problems and arrive at their solution by the most direct method.

WITH such instruction required, it may seem that trade mathematics teachers might be better selected. It has been assumed that teachers have had enough mathematics to teach arithmetic. This no doubt is true, but if they have had no shop or factory experience they usually are not practical enough to apply their knowledge to definite shop problems.

In schools where trade mathematics is taught as a separate course there is a tendency to shift the burden to unwilling or unable hands. It is within the writer's acquaintance to know of a commercial teacher who has never had a shop course, but who must teach trade mathematics. Another, although an engineering graduate, but without shop experience, is expected to teach the mathematics of indexing on the milling machine.

In senior high schools where the students are able to select and practice at a trade, the teacher of the shop course should teach the trade related mathematics and science. This is the general practice in trade and technical schools, and with Smith-Hughes courses it is a requirement that the teacher of the trade related subjects have a credential for the shop course. No solution is apparent except to convert more shop courses from industrial arts to trade training.

Mathematics and the Home Front

By WALTER W. ISLE

Representatives of the Office of Price Administration and school people alike have insisted since the OPA was first established that control of scarce goods by the Government offers schools one of the best opportunities they have ever had to make their teaching really functional, to teach rules and principles and fundamentals in terms of a vital situation of the moment, and at the same time to contribute toward a better public understanding of the needs for rationing, price controls, and various conservation and production programs. In this article, Dr. Isle shows how the whole "home front" program can be utilized to advantage by the mathematics teacher.

Dr. Isle is educational services specialist for Region VIII, Office of Price Administration, with headquarters in San Francisco. As such, his duties are to assist schools and colleges in all activities related to the OPA program. For many years he was a superintendent of schools in Oklahoma and for four years was president of Southwestern Oklahoma State College.

IN the parlance of the sporting world, the home front is a "natural" for the teacher of mathematics. Most home front programs are in operation because of facts or conditions mathematically established. Each of the major rationing measures was inaugurated after careful statistical studies of quantities of materials on hand and in production and amounts needed for civilian and military uses. Salvage and conservation campaigns are launched from bases constructed from mathematical data. Price ceilings are set after detailed analyses of facts and figures. Practically all of the home front programs are outcomes of and are justified by mathematical computations.

Mathematics can contribute in a particularly effective way to home front strategy and campaigns. The objectives on this front are understanding and cooperation. "Only an informed America is an invincible America" is the slogan that guides all strategy. "Explain" and "inform" are important words in the daily orders from headquarters. "Educators assume a special responsibility to provide facts which by their accuracy and completeness will build public respect and confidence."[1] Home front guns are loaded with information instead of explosives.

Mathematics is specially adapted to produce such ammunition, without radical conversion of its production system. Accuracy and completeness are the products particularly of the precise thinking developed by mathematics. The basis of convincing explanation is the mathematically established fact.

Mathematics can translate the unfamiliar, theoretical thinking that lies behind home front operations into arithmetical situations or problems which can be readily understood by the ordinary American—Stuart Chase has so translated the generalized ideal of "Freedom from Want."[2] Concepts such as "in-

[1] *The Teacher's Stake in the Control of the Cost of Living*, an address by Leon Henderson, August 31, 1942.

[2] See his *Freedom From Want*, Harper and Brothers, 1942.

flationary gap" or "the bidding up of prices by surplus earnings" can be clarified similarly and thus they will be understood by the average citizen as a menace to his pocketbook or to the well-being of his family.

If we make the evidence and the operation clear, the enemy is changed from a far-off bogy into an ominous reality. The citizen-soldier comes to see the operations of price control, rent control, and rationing not as the clubs of an arbitrary bureaucracy, but as instruments of an informed and alert people, determined to protect their home front in war time. Thus the citizen comes to see himself as a part of government, rather than as a victim of it.

To the mathematics teacher is thus presented the golden opportunity to develop in America respect for and reliance on verifiable facts as a basis for thinking and as a test of argument. To meet successfully this opportunity will mean that the processes of democracy will be strengthened at home even while the institutions of democracy are being defended with "blood, sweat, and tears" from foreign foes.

THE important practical problem is to devise methods and procedures whereby the foregoing contributions can be made in the day-by-day activities of the typical mathematics program. The simplest and most effective way to accomplish this is to use problems involving home front operations as illustrative and drill material, consistently and extensively. There are almost limitless possibilities for such applications. From simple exercises in the four fundamental processes, through decimals, percentage, proportion, equations, and graphical methods, it is possible to formulate problems involving home front situations and data. There is high mathematical content in all such subjects as point rationing, ceiling prices, food supply, inflationary spirals, salvage, subsidies, agricultural parity, hidden inflation, victory gardens, victory models—the list could be continued indefinitely.

The above procedure is in keeping with modern emphasis on real problems drawn from the real world of the student. The challenge here is to vitalize teaching with the dynamics of life in such manner that students will experience the thrill of identifying themselves with one of history's great crises. The suggested procedure also is in line with the thinking that social problems are a proper concern of mathematics as well as of other subject matter departments.[3] The purpose of the applications suggested is not alone to use these areas as sources of practice problems, but to interest the student in the operations themselves. The home front presents many splendid opportunities for the implementation of such thinking.

For the development of broader understanding of certain crucial topics, special units of study may be developed. The food problem, mileage rationing, the Treasury's bond and stamp campaigns, manpower utilization, are typical operations which have sufficient mathematical content and background for a study unit. Every item in the President's Seven-Point Program might be so handled. A series of such units might be combined into a semester course in war-time consumer mathematics.

STUDIES of the shortcomings in mathematics of students who have entered the armed forces during the present war have indicated that the most pronounced deficiency is in the fundamental operations of arithmetic. The

[3] *Arithmetic in General Education*, Sixteenth Yearbook of the National Council of Teachers of Mathematics, Bureau of Publications, Teachers College, Columbia University, 1941.

real need seems to be not for special war-time courses in a different kind of mathematics, but for better teaching of the mathematics that is regularly offered.

One cause of this deficiency well may be that pupils have learned their arithmetic largely through solving artificial and teen-age problems. Refresher courses will not necessarily remedy such a deficiency if these courses simply revive the same kind of problems. What would seem to be more effective is a series of recurring units offered in the regular mathematics courses in each year of high school. The content should be largely arithmetic, regardless of the course in which the unit appears. Skill in fundamentals will be renewed annually through exercise with problems with which both youth and adults are vitally concerned. Right now these problems will be war-time problems, drawn from the fighting and the home fronts.

Both applied problems and units can be developed in the classroom, in the curriculum laboratories of the public school or the teacher training institution, and in the mathematics workshops.

Home front problems and projects are well adapted to coöperative study by two or more subject matter departments. Home economics, sociology, business, art, and economics are departments which could work with mathematics in such studies.

MATHEMATICS can render valuable service to home front programs, particularly to the extensive rationing programs, by assisting local agencies in the educational campaigns that usually are a vital part of such programs. Much effective evidence in the form of charts, graphs, and statistical data can be prepared in support of these programs. The value of contributions of this nature which mathematics classes and departments can make has already been demonstrated in the point rationing campaign.

An illustration of how a unit on home front mathematics can be developed follows:

Suggested unit: The Rationing of Commercially Processed Foods.

Grade level and subject area: High school General Mathematics or Arithmetic.

Teacher's purpose: To coöperate with the rationing program and thus contribute to the winning of the war on the home front.

Class purpose: To understand why commercially processed foods are rationed.

The problem: What were the conditions which made this rationing program necessary?

Suggested procedures:

1. Make a mathematical analysis of the annual supply of typical food items over a period of years.

2. Analyze the changing demands which have diverted this supply into such channels as the feeding of armed forces, lend lease, building up of surpluses for invasion and future emergencies. Compute percentages, proportions, and so forth. (See December, 1942, issue of *Fortune* magazine.)

3. Study the mathematics of the problem of space and weight in the shipment of foods, the relation of this problem to the rationing of foods (mathematical aspects).

4. Study the mathematical phases of the manpower problem and its relation to the production of foods.

5. Study the mathematical aspects of the relation of increasing purchasing power to the food situation, the problem of the concentration of this purchasing power in groups while large numbers of people are still on prewar salary and wage levels.

Suggested Activities:

1. Have committees check rumors of adequate supplies of such foods as sugar, coffee, and canned foods by securing actual data on stocks available and demands for the same. Prepare charts for exhibit purposes and for presentation of evidence to P.-T. A., civic clubs, and other groups. Do the same with editorials, radio speeches, and so forth.

2. Work out a number of budgets for families on different income levels, computing percentages allocated for housing, food, clothing, and so forth. Make charts and bar graphs for exhibit purposes. This might well

be a coöperative project with home economics, art, and so forth.

3. "Play like" the class is a typical American community. Have members of the class represent local food stores; record daily reports on imaginary sales and stocks over a period of time. Have another group endeavor to control the flow of foods by changing point values from time to time.

4. Have students bring in and interpret to the class graphs and charts on the food situation.

Suggestions for Problems and Exercises:

Through use of the chart on page 124 of the December, 1942, issue of *Fortune*, many exercises and problems in computing percentages, proportions, and in the fundamental operations can be worked out.

Through use of this and similar graphs, true and false questions can be formulated which will give pupils practice in reading and interpreting graphs.

Exercises in the construction and interpretation of graphs and pictographs can be developed from the page of "War Facts" in *Victory* magazine.

Many problems and exercises can be devised which deal with the point values and the purchasing of rationed foods.

THIS brief discussion is intended only to open up the possibilities for participation by teachers of mathematics in the extensive area in which the home front operates. The thesis is that the home front not only presents an opportunity for mathematics, but that the home front needs the help of mathematics. Individual teachers, departments, organizations of mathematics teachers, and teacher training institutions will, it is hoped, be able to develop more specific and extensive procedures whereby this opportunity can be met and the help provided.

SUGGESTED BIBLIOGRAPHY

1. *Agricultural Index* (a guide to periodical and bulletin literature). Published monthly by the H. W. Wilson Company.

2. *Bibliography of Agriculture:* Section A, "Agricultural Economics and Rural Sociology"; Section F, "Food Processing and Distribution." United States Department of Agriculture.

3. *Bureau of Labor Statistics.* Published monthly by the United States Bureau of Labor.

4. *Charting the Three R's of 1943* (a planning guide for teachers and school administrators). OPA Educational Services Branch Bulletin, December, 1942.

5. "Consumer Education in Wartime," *The Bulletin of the National Association of Secondary-School Principals,* Washington, D. C., November, 1942.

6. *Education for Victory.* Published biweekly by the Office of Education, Washington, D. C.; $1.00 per year.

7. "Food in 1943," by T. S. Harding, *Journal of Home Economics,* 35:1-5, January, 1943.

8. "Food Rationing: The Time Is Now," *Fortune,* 26:124-125, December, 1942.

9. *How to Check Inflation,* by John M. Clark. Public Affairs Pamphlet No. 64, Public Affairs Committee, 30 Rockefeller Plaza, New York City, 1942.

10. *How to Win on the Home Front,* by Helen Dallas, Public Affairs Pamphlet No. 72.

11. *1943 Agricultural Charts,* Bureau of Agricultural Economics, United States Department of Agriculture, October, 1942.

12. "Nutrition and Food Supply: The War and After," by J. D. Black, *Annals of American Academy of Political and Social Science,* 225:1-221, January, 1943.

13. *OPA Bulletin for Schools and Colleges.* Published monthly by the Educational Services Branch of OPA. Available through district and regional offices.

14. *OPA Quarterly Reports:* First, Second, and Third Quarters.

15. *Price Control Report:* "The Accomplishments of Price Control." Division of Research, Price Analysis and Review Branch. Available through the local OPA Regional Office.

16. *Price Control Report:* "The Effectiveness of Price Control." Division of Research, Price Analysis and Review Branch. Available through the local OPA Regional Office.

17. *Rent Control: A Graphic Presentation,* Rent Department, OPA. February, 1943.

18. *Victory:* Official weekly bulletin of the Office of War Information, Washington, D. C.; 75 cents per year. (See especially the feature page on "War Facts.")

19. *The War on the Home Front: How You as a Consumer May Help Win the War* (contains nine units of study for secondary schools). Office of Price Administration, Region VIII, San Francisco.

20. "Wartime Living for Peacetime Security," *Building America,* Vol. 8, No. 1, (Americana Corporation, 2 West 45th Street, New York City, October, 1942.

Advising Girls with Regard To Mathematics

By HARRIETTE BURR

THE challenge has been given to womankind: A Woman Trained to Do the Work of Every Man Needed on the Battlefront. Herein lies one of the greatest contributions of teachers to the manpower problem in this war effort: to see that each girl as well as her family hears this challenge; and to so guide a girl in her program of studies that she is becoming a specialist in some one field of work in order that she will be competent to assume her duties in the war effort.

In this manpower crisis the need for women workers is acute; but the shortage in technical and scientific fields is crucial. New and broader vocational opportunities are opening for women in engineering, science, and craft work. But there is more than opportunity involved; today it is an obligation for those with talent and interests in these fields to enter them.

For the individual teacher counseling the individual pupil, there often is a sense of conflicting responsibilities in balancing the destiny of the pupil against the need of society. To secure this balance, it is essential that the teacher take greater care than ever before in helping a student evaluate his own capacities so that he may know with some certainty that he will be engaged in that field in which he can make his greatest contribution to the war effort.

With headlines blaring the need for women workers, and with women from all communities joining the parade to war industries, it might be assumed that girls are planning for their active part in this war effort. This is not the case, however, as the following quotation emphasizes:

If the girls in school have recognized this need for women in industrial and technical vocations, then there should be evidence of an increased interest in matters scientific and technical. Enrollment of girls in mathematics classes and science classes should approximate that of boys; they should be electing shop work and reading the popular technical periodicals. The differences between scholastic interests and preparation of boys and girls, so far as it has been due to differences in future plans, should tend to disappear. And yet, there is no evidence to show that such is the case. For all practical purposes, women are as unprepared to assume their technical rôle as they were when Hedrick [1] made his statement [2].

Miss Burr writes that the problems presented in this article are those that have arisen as she counseled tenth grade students on their programs of studies for the remaining two years of their high school courses. The answers contained herein are based on facts and opinions she obtained from people throughout the country with whom she has talked or corresponded. Because of space limitations, she was not able to list specifically the contributions made by these individuals, but she wishes to acknowledge the invaluable assistance she received.

Miss Burr is chairman of the Mathematics Department in the Ventura Union Junior High School, where she has taught mathematics for the past five years.

[1] E. R. Hedrick, "Mathematics in the National Emergency," *The Mathematics Teacher*, 35:253-259, October, 1942. (Read February 20, 1942, before the National Council of Teachers of Mathematics at San Francisco.)

[2] Acting Dean Lucien B. Kinney, Stanford University; unpublished letter.

TABLE 1.—*Occupational Levels with Serious Labor Shortages**

Our shortage in	Percentage of executives who regard labor shortages as acute or serious		
	Is serious or acute	Will become serious	Total
Semiskilled labor	56.7	12.1	68.8
Technicians	48.7	9.3	58.0
Unskilled workers	41.8	11.6	53.4
Supervisory personnel	35.2	10.4	45.6
Clerical help	28.4	10.1	38.5
Managerial personnel	18.5	6.4	24.9

* "Fortune Management Poll," *Fortune*, Vol. 27, February, 1943, p. 140.

It is crucial that these girls be aroused to the fact that they themselves will be taking an active part in this cataclysm so that they can save precious hours by securing adequate training before their call to duty. Thus, it appears that detailed guidance is needed and that it is the teacher's responsibility to give it.

IN order that students may face their responsibility of preparing for a vocation useful in the war effort, we must know the occupations in which there is a great need for additional workers. College placement executives state that three of the vocations in which additional workers are most urgently needed are engineering, nursing and medicine, and accounting. The intensity of the need for engineers is shown by the following statements:

If a school will send now one extra pupil to engineering training for every three it sent last year . . . all needs will be met.[3].

A recent survey of the plans of the eight (airplane) companies operating in California shows a larger number of engineering college graduates desired before the end of 1943 than will likely graduate from the entire nation's colleges without Army and Navy commissions. And we are just talking about California companies [4].

[3] *Engineers Are Needed*, a pamphlet published by the U. S. Office of Education, Vocational Division; p. 5.

[4] C. T. Reid, Douglas Aircraft Company, Inc., Santa Monica, in "Engineering Job Training Opportunities in the Aircraft Industry," an unpublished paper presented at the Texas Personnel Conference, University of Texas, October 29, 1942.

Today our boys are being sent to the armed forces, not to colleges. It follows that our manpower reserve for engineering consists largely of women. This fact must be clearly recognized by the schools.

Tables 1 and 2 list occupations in which there is urgent need for additional workers. In vocations which require college training, it will be found that the majority involve a mathematical and scientific background. It is worthy of note, however, that there are ten occupations in which college graduates with little mathematical background can fill an urgent need.

Table 1 portrays the levels of greatest shortage of workers. A questionnaire was sent to 5,000 ranking business executives for this "Forum of Executive Opinion" as compiled by *Fortune*. It is noteworthy that over 50 per cent of these executives anticipate shortages in semiskilled labor, *technicians*, and unskilled workers. It is also interesting to compare the shortage in clerical help with that in semiskilled labor and technicians.

Almost three-fourths as many *additional* women will go to work in 1943 alone as entered industry during the entire period of January, 1940, to December, 1942. At the end of 1942 there were 15,000,000 women at work. This was an increase of almost 4,000,000 over the 1940 total. In January, 1943, the

TABLE 2.—*Vocations in Urgent Need of Additional Workers*

THOSE WITH A COLLEGE EDUCATION

Health

Physicians *, †
Nurses *, †, +
Experts in public health *
Psychiatric-social workers *
Physiotherapists *, ‖
Occupational therapists *
Laboratory technicians *
Bacteriologists *
Chemists *
Pharmacists *, ‖
Dietitians *, ‖

Diplomatic Services and Special Investigators

=Linguists *
Mathematicians *
=Secretaries *
=Journalists ‖

Schools and Colleges

=Teachers *
=Nursery school experts *
=Psychologists *

Science

Physicists *, +
Chemists *, +
Chemical technicians ‖
Geologists *
Metallurgists ‖, +
Meteorologists ‖
Mathematicians *
Agriculturists *
Home Economists *, †

Business and Industry

Engineers *
Electrical +, ‡
Chemical +
Mechanical +
Sanitary +
Architect +
Industrial Designers ‡
Telephone ‖
Radio ‖
Draftsmen ‖, +, †, ‡
Mathematicians *
Engineering computations ‖
Statisticians *
=Accountants*
=Secretaries *
=Personnel work ‖
=Public administrator ‖
=Economist ‖

THOSE WITHOUT A COLLEGE EDUCATION

Semiskilled occupations

Riveting ‡
Drill press operators ‡ } in aircraft manufacturing
Final assemblers ‡
Chassis assemblers in radio manufacturing ‡

Clerical and stenographic occupations in Civil Service. †

* Included in list of occupations in which workers are needed in *Higher Education and National Defense,* issued by the American Council of Education, Bulletin No. 35, October 17, 1942.

† Included in list of Mary Elizabeth Pidgeon, chief, Research Division, Women's Bureau, U. S. Department of Labor.

+ Civil Service examinations in these vocations open to women.

‖ Listed in *War Jobs for Women,* published by the Office of War Information, Magazine Section.

‡ Listed by Arthur E. Wood, Area supervisor, U. S. Employment Service, Los Angeles.

= Occupations requiring little background in science or technical mathematics.

War Manpower Commission estimated that another 2,700,000 women would be needed in industry before December, 1943.

THE list of vocations offered in Table 2 adds impetus to the fact that today industry is pleading with university placement bureaus to find women who can follow technical vocations. Moreover, for noncollege women, the U. S. Employment Service is advertising and dramatizing the need for women in crafts and the ease with which they can become semiskilled. Recognition of women in industry is borne out by their acceptance into labor unions and by their promotion to supervisory positions.

It is probably most difficult for women to realize that they are really wanted as engineers and scientists. Regarding these fields as occupations for women, there are two schools of thought represented by (1) those who know the present demand for women engineers and (2) those who have watched women struggle again and again to find an opening in this occupation. All agree, however, that today engineering is an occupation in which women are greatly needed, and one in which they are being accepted, both on the professional and subprofessional levels.

The future of women in engineering is problematical, but optimistic as noted below. Engineering for women is a pioneering field; probably it is to be like medicine was at the end of World War I. A very few women already have

surveyed the route (0.4 per cent of all engineers in 1940 were women, as compared with 4.6 per cent of all physicians and surgeons who were women); and many more will tread the route during the immediate future. It appears that a new profession is opening for women.

Whether or not a girl studies in the fields of science or engineering will depend on two facts: (1) the intensity of her interest in the field; and (2) the future of women scientists and engineers after the war. It is not judicious to urge a girl to spend four of the most precious years of her life in becoming a scientist only to find that there is no place for her in the postwar era. There must be some probability of continued work in her career if she so desires.

To summarize the opinions offered by industry, the War Manpower Commission, and the Women's Bureau of the U. S. Department of Labor, it appears that a girl can hope for more opportunity in science and engineering than in the past; but she should undertake a vocation in these fields only if she has the personality and vitality as well as the talent to enable her to pioneer in a new field.

ADEQUATELY to replace a man in any vital rôle, a woman must meet the same requirements as the man. To accept the slogan, A Woman Trained to Do the Work of Every Man Needed at the Battlefront, it will be necessary for both the teacher and the girl to know definitely about all requirements for entering these new vocations. The slogan means that the training that has been given previously to our boys is now needed by our girls, for example:

In mathematics: The craftsman can use as much mathematics as he can master. This includes mathematics through calculus.

The scientist must have mathematics through trigonometry in high school.

The clerical worker needs mastery of arithmetic.

In science: The craftsman needs a general knowledge of the elements of the scientific world and a detailed knowledge of the science which applies to the particular craft of the individual.

In industrial arts: The craftsman needs sufficient training in at least one field to become a skilled workman—a specialist.

In the past men have repaired automobiles. According to the slogan, women will have to be trained to do this. Men have been trained as carpenters who could construct gliders. Women will have to be trained as skilled carpenters. Women are becoming trained in the metal-working trades more than in any other; but they will have to become skilled metal workers: machinists, toolmakers, and so on. These fields require technical training and skill. Thus, besides continuing the work they have always done in the home and in the commercial world, women will have to assume these added competencies in the industrial world. They will work in three places: in the armed forces, in defense industries, and on the home front.

ADEQUATE counseling must take into account the needs of the individual as well as the needs of society. This fact raises many disturbing problems for the counselor. As the girl of today first realizes that hers is the responsibility of meeting manpower needs of industry as well as those of commerce and the home front, she wonders if she should change her career plans so as to become skilled in one of the widely advertised fields: *e. g.*, crafts or clerical work. Both the Department of Labor and the War Manpower Commission concur in the opinion that almost every vocational field contains some essential activities. With manpower so crucially short, however, it is vital that each individual be working up to her highest capacity. This can be done only if the girl is guided into the vocation in which she is interested,

happy, and successful. Here, then, is one of the greatest responsibilities of the teacher today: to guide these girls into occupations in which they will make a successful contribution to the war effort.

If the girl has the talent, interests, and background necessary to be successful as an artist, a teacher of social studies, or a journalist, then she should be encouraged to follow her vocational choice. If not, it becomes the responsibility of the teacher to help her evaluate herself and choose a war-adapted occupation in which she will succeed.

Advising the superior girl as to the part she should play in the war effort is a critical problem for the counselor. Teachers find that when the responsibility for work in the war effort is presented to superior girls, their first reaction is to drop their studies and enter a defense industry as an unskilled or semiskilled worker.

If we are to meet this problem, we must first of all challenge the superior girl as to what can be her best contribution to the war effort: not the semiskilled work that any can do, but the scientific or engineering work that only the gifted student can understand—work in which shortages are just as acute as in the craft work. Officials in the War Manpower Commission, the Women's Bureau of the U. S. Department of Labor, and the U. S. Employment Service all concur that superior students interested and talented in scientific and technical occupations should be challenged to assume as their part in the war effort the period of scientific and mathematical training required for technical work.

WHETHER womanpower is drafted or voluntarily enlisted, it is certain that single women—the girls in school today—will be working in defense industries or essential work as soon as their school training is completed. This in turn means that it is the responsibility of the teacher to make sure that each girl is skilled in some work that is needed in this war period.

Within this problem of vocational guidance for girls lies one of the greatest responsibilities of every teacher in this war effort. Above all else stands the challenge to guide these girls:

1. To a recognition of their coming active part in the war effort.

2. To a planned preparation for skill in some specific war work.

3. To a knowledge, both of the multitude of vocational opportunities and of the dire need for workers with scientific or technical training in such vocations as engineering, chemistry, nursing, and medicine.

4. To an analysis of their own talents and interests in relation to the vocations in which workers are needed.

Most crucial of all is the challenge to teachers to help girls select a vocation and plan their program of studies so that their abilities will be used to the maximum. With three of the greatest manpower shortages in engineering and science, nursing, and medicine, it is important that girls with ability and interests in these fields be guided into them for study rather than be allowed to wander into craft work through ignorance of the opportunities in the other fields.

Today, as always, is placed in the teacher's hands the responsibility for planning with the student so that she will achieve a balanced womanhood, skilled in the duties and obligations of her home and skilled in some vocation as a life career. But now an even greater responsibility is placed in the teacher's hands: to plan both for the individual's welfare and for the needs for workers in this manpower crisis.

The California Subcommittee On Mathematics

By WILLIAM M. WHYBURN

IN October, 1942, the California Subcommittee on Mathematics submitted a progress report to the California Committee for the Study of Education. This report contained general conclusions which were stated as follows:

It is the opinion of the Subcommittee on Mathematics that our California schools and their teachers can make an essential and invaluable contribution to the war effort by continuing to teach all of the mathematics which has formed and now forms a most important part of their work. Students are leaving school at every grade and age to enter either industry or the armed forces in capacities where they find mathematics a prime requirement.

A fourth-year high school student without skill in arithmetic should, at the time, be given arithmetic intensively, followed by as much algebra as can be included. A third-year high school student without suitable skill in arithmetic should be started with intensive training in this subject. For him there will be time, also, for algebra through quadratics and some geometry. It will be noted that these students are more mature than the usual beginner and also know their immediate need for mathematical training when they start these basic subjects. Hence, they can cover the materials at a relatively faster pace.

For students in the earlier grades, there will be time for the usual sequence of algebra, geometry and trigonometry. For these students the question of time is not pressing, and the mathematics courses already being given in many schools are suitable.

This Subcommittee agrees with the opinions of many representatives of the Armed Services and industry that the mathematics courses in schools must continue to place emphasis on basic and fundamental parts of the subject treated. Such applications as are given, and there should be as many as possible, should be primarily for the purpose of illustrating and giving training in basic mathematics. The specific uses of mathematics in the various branches of the service and industry are best given by appropriate instructors after entrance into service. These are technical subjects and are therefore adequately taught only by the technicians themselves.

When courses are given in basic principles of mathematics, it is clear that such courses fit the needs of both boys and girls, whether for service in the armed forces or in industry.

There is general agreement on the point that few students can use arithmetic satisfactorily. It is therefore urged that all teachers beginning with those in our primary schools contribute their utmost towards the training of pupils in the fundamentals of arithmetic. Skills attained at any level should be maintained by cumulative review and use at later levels. Teachers of algebra and geometry should utilize the many opportunities which exist in their courses for continued use of arithmetic. Also, the teachers of geometry should further develop algebraic skill through having their students use it in geometry.

In regard to this article, Professor Whyburn of the Department of Mathematics, University of California at Los Angeles, and chairman of the California Subcommittee on Mathematics, writes:

"It was hoped that a rather complete report of the California Subcommittee on Mathematics would be ready for publication in the present issue of the 'Journal.' Many complications, however, have combined to delay the preparation of this report beyond the time that would permit its publication as planned. Transportation difficulties have made meetings of the full committee impossible, and since the first of January meetings of the sections of the committee have been impractical. The report is taking shape rapidly, nevertheless, through correspondence with members of the committee, and it is hoped that it can be made available for early publication."

It is the unanimous opinion of this Subcommittee on Mathematics that our schools will not be rendering their greatest possible service to the Army, Navy, and war industries, unless they conscientiously urge their students to take basic mathematics, including arithmetic, algebra at least through quadratics, concepts and constructions of plane and solid geometry, and trigonometry.

The above general conclusions were based on a careful study of the mathematical needs for young men and young women who are destined for service with the armed forces, with the war industries, or with any one of the many peace-time industries which must go in war time and which will continue at an accelerated rate after the war is won. The Committee found that the same basic mathematics is needed for students in any category, be it directly associated with the war program or with service on the home front.

In general it is felt that substantial courses in arithmetic, algebra, geometry, and trigonometry should be given in such a way that the mathematical principles and procedures are emphasized through varied and numerous applications to present-day problems of the war and home fronts. Teachers of mathematics can and should do much to make the greatly enlarged school mathematics program substantial—both for the war emergency and for the period which follows the war—through familiarizing themselves with applications of their subject in a variety of fields which now occupy the interest of their students.

As indicated above, the Subcommittee feels that in a particular school much of the responsibility for determining what mathematics courses are to be given and what material is to be included in these courses should rest with the mathematics teachers on the faculty. In many cases, few changes in the formal outlines for existing courses are necessary, but some variations in emphasis and considerable expansion of applications are needed.

For groups of students who have not had strong mathematical training, and who must leave school in a short time, there is need for a special course embodying fundamental topics of arithmetic, algebra, and—in so far as time permits—geometry and trigonometry. These special courses should not be available to students who can take the regularly organized courses. They should be taught with unusual care and patience by a strong mathematics teacher.

IT is hoped that these preliminary remarks about the work of the California Subcommittee on Mathematics will indicate the direction of its studies. The Subcommittee wishes the coöperation of all teachers, particularly those in mathematics and science, in the work which it is attempting to do. We believe that such coöperation will contribute much to a substantial war-time and peace-time mathematics program in the California schools.

Placer Union High Offers a Complete Summer Session

A complete summer semester is being offered this year by the Placer Union High School, Auburn, California. Extending from June 21 to September 25, the summer semester will be conducted at the Tahoe Branch of the Placer Union High School, which is located at Tahoe City on the shore of Lake Tahoe. Classes are to be held six days a week within the above period, and a full half-year's work can be completed during this time. Instruction is being offered in most of the regular high school subjects.

Coöperative Reorganization Of Mathematics

By LUCIEN B. KINNEY

THE issues involved in the reorganization of secondary mathematics to meet present-day requirements appear to come to a focus in these four questions:

Who should study mathematics, and for what purpose?

What mathematics should be studied in preparation for each of the important services in the emergency?

How can the curriculum be so organized as to meet the requirements for each kind of service?

What classroom procedures will be effective in producing the required competencies?

Some of these are new problems, while others are old problems in a new setting. For none of them do we have sufficient information to direct an intelligent attack. Yet we cannot postpone action to wait for adequate data. If we act in the light of the best available information and provide for evaluation and reporting of results, we may capitalize on successful experiments and prevent repetition of errors.

Clearly, this project is too formidable for any one individual, or for any group acting as individuals. There must be coöperation of effort, together with leadership, if we are to be certain that we are utilizing all available resources in the most effective way. Let us consider, first of all, the individuals and institutions that should be mobilized for an attack on these problems and then make a preliminary survey to reveal the possible contribution of each in finding an answer to each question.

Naming the various agencies which must be involved in any effective reorganization of the mathematics curriculum, this article concludes the symposium on "War-Time Mathematics in California Secondary Schools." Dr. Kinney, who organized the series of contributions, planned this article as a conclusion to the symposium, making it a constructive outline of next steps that must be taken if the recommendations of authors of the earlier articles are to be followed and if the opportunities they point out are to be realized. Most interesting in the discussion of the reorganization of mathematics as a coöperative project is the description of the contemplated activities of the California Mathematics Council.

Professor Kinney is acting dean of the School of Education, Stanford University. He has taught mathematics in various schools before coming to Stanford, among them State Teachers College, Oswego, New York, where he was head of the Department of Mathematics. He is the author of several texts in the mathematics field.

ONE is impressed at the outset by the fact that modern education is essentially a coöperative project. An adequate program of education for mathematical literacy will require the collaboration of the school, the home, the State Department of Education, industry, the armed forces, the governmental agencies, and the various professional organizations, including those responsible for publication of professional literature. This is to be expected,

in view of the fact that learning is by wholes—the whole pupil is involved in every learning experience, and the whole of society is responsible for, and directs, his learning experiences.

Certain groups, however, have a primary and definite responsibility in the enterprise. It is these we wish to identify. Others have a responsibility for collaboration but have equally important obligations in other fields. These we shall mention incidentally, if at all, while recognizing their importance.

Of primary importance in this project, of course, is the schools; and particularly important therein are the individual mathematics teachers. They are in the strategic front lines, continually confronted with problems that demand immediate solution. To meet these requirements, however, the mathematics teacher has professional training and experience possessed by no one else.

It may appear, superficially, as a delineation of the obvious to point out that only the mathematics teacher has the necessary combination of understandings—as to the purpose of education, the nature of his field in relation to those purposes, and the procedures for effective direction of learning—for planning curriculum and instruction in his field. And yet, in crises like the present, we frequently fall into the error of relying too much on those in other activities to appraise the mathematical requirements for success and to point out the shortcomings of our products.

Collaboration from every source is needed in collecting factual information, but the final responsibility for interpreting the facts and translating the educational objectives derived from them into a program of action lies with the school, and in particular, with the mathematics teacher.

A second agency whose rôle should be considered here consists of the various professional organizations of mathematics teachers. These organizations have a special and important part to play.

The National Council of Teachers of Mathematics, organized over twenty years ago, has promoted the effectiveness of mathematics teaching, primarily through its publications. The present emergency has called attention to the necessity for an organization within the State, dedicated to the same purpose, that can assume more active responsibilities. Accordingly, the California Mathematics Council was organized at the Mathematics Institute sponsored by the National Council during the holidays.

While not affiliated with the National Council, the California Mathematics Council has the same purposes. Since its membership is open to all mathematics teachers and to others interested in the promotion of effective mathematics teaching, it is representative of the mathematics teachers acting as a group. It follows that in the work to be done the Council should serve two functions: to direct the total coöperative project and to provide for interchange of information among its cooperating members. In the few months of its existence the Council already has taken important steps in performing both of these functions.

The Council provided an excellent illustration of the way in which organization and direction for the coöperative attack may be forthcoming when it assumed the initiative in planning a summer workshop whose purpose is to provide facilities not only for teachers and administrators working on their local problems, but also for an attack on the more general problems of guidance, curriculum, and instruction in

mathematics as these areas have been affected by the emergency. The Executive Committee of the Council is working with the Stanford School of Education in planning the activities. Some of the immediate possibilities of the workshop will become obvious in our later discussion.

A third agency with a major responsibility in the reorganization of secondary mathematics is the institution for teacher education. An examination of the functions of those institutions that prepare teachers of mathematics reveals that necessarily they must be partners in these activities. Effective preservice education must deal directly with the four questions listed at the beginning of this discussion. This fact implies a responsibility for teacher education in the initiating and directing of research necessary for the collection of adequate and complete information on each question.

Turning to the in-service education of teachers, there is no more effective means for promoting growth in teaching competence than to make it possible for the teacher to solve her own problems. Assistance for this purpose may assume one or more of a variety of forms. We have seen the summer workshop as one possibility. Provision for consultant service is another. Collaboration in committee work, as in the case of the Subcommittee on Mathematics of the California Committee on Education, is a third. We shall note other possibilities later on.

In particular, it is the responsibility of the teacher education institutions to provide every facility needed by those teachers who are being "converted" to mathematics from other fields. The important thing is that the institution shall recognize the importance of the problem and its own responsibility with respect to it.

If we agree that these three agencies have primary responsibilities for the coöperative enterprise of reorganizing mathematics—the individual schools, with the mathematics teachers assuming the leadership; the professional organizations of mathematics teachers; and the institutions engaged in preparing teachers of secondary mathematics—the important question is this: how can they act most effectively in a well-planned, scientific attack on these four focal problems? Let us turn to each of the questions to see where the answers must be sought.

WHO should study mathematics, and for what purpose? This question is of concern to the individual pupil who must appraise his own capacities in terms of the requirements of the field he is considering, or into which probably he will be called. It is of equal concern to each faculty member who has responsibilities for counseling and to the administrator who must organize the curriculum and determine what courses are to be constructed.

In each school system it is the mathematics teacher who must know the mathematical requirements of each field and who is responsible for seeing that both faculty and pupils are properly informed. The problems requiring immediate action are these: how can this information be secured and how can it be made available to each mathematics teacher?

While a great deal of important information still needs to be collected, the most important and immediate of the two problems is the second. There is an abundance of existing information waiting to be analyzed and distributed to the teacher. The training programs of the armed services are making rapid headway in defining the mathematical requirements of the various branches.

We may expect that the Council will take steps to make them known through its bulletins and conferences. Many mathematics teachers are well informed as to the needs of those entering various branches of industry. Such information should be made available at once through publication in professional periodicals or in the Council bulletin.

Another source that should be tapped is the data from various manpower surveys. The formidable task of analyzing and interpreting such data and presenting them in a usable form might well become of joint concern to the Council and the teacher education institutions.

Even after such collection of available data and additional surveys to supplement the information now available, there still will be questions on which it will be necessary to collect the best judgments of well-informed authorities. This procedure appears, at the present time, as the best recourse on such questions as these:

What technical fields are most suitable for women?

What opportunities for advancement are there in each field?

Will these opportunities be permanent or temporary for the emergency?

Here it is probably the responsibility of the Council to take the initiative in securing the opinions of the best judges, to serve as a basis for guidance in the schools until events shall classify the situation.

WHAT mathematics shall we teach? This question grows naturally out of the previous one. To a considerable extent, research in either area will provide data for the other. We are concerned here, however, with the problem of discovering the real and important applications of mathematics and the mathematical abilities that are called for in making the applications.

Here again the chief problem is to discover and to devise means for collecting and making available materials that already exist. The literature in the field contains reports of individuals and committees that should be analyzed and evaluated. A number of good textbooks have appeared recently that present authoritative treatment of valuable applications. Many of the mathematics teachers themselves are competent in one or more of the fields of industry or the armed services. The problem is how best to utilize the machinery of the Council and the professional journals to get this information to all teachers.

There still will be, of course, a necessity for supplementing these data and keeping them up to date. During the period following the first World War a popular form of educational research was the analysis of adult activities to provide material for curriculum construction. While the job analysis technique alone never proved adequate for this purpose, it did provide a wealth of live and interesting curricular materials. It appears that we are again in need of this type of study, carefully directed, with the results properly appraised. To carry on this activity becomes a responsibility of the teacher education institutions.

HOW can these modern applications be incorporated in an effective curriculum? Shall we set up a new course for each important field of application, or shall we retain the present organization and introduce the new applications as they fit in, while dropping those that are obsolete?

There is not one single answer to this question. It is quite clear that in planning a new course, to meet the well-defined needs of a special group, nothing is to be gained by trying to patch up a traditional course to serve this new

purpose. This is true, for example, of many courses now being organized in the junior and senior years of the high school for pupils who are belatedly discovering the importance of mathematics in the field they are entering.

While it would be interesting to stop and locate the responsibility for the existence of this situation, this is a luxury we must postpone for the postwar world. The challenge is to construct a course that will develop the competencies most urgently needed, provide the basis for others that must be developed later, and result in interests that will cause the pupil to seek, rather than avoid, later opportunities for studying mathematics.

This is a problem that requires the fullest coöperation of all three agencies we have mentioned. The schools must take the initiative in discovering the needs of the pupils and in undertaking the curriculum construction. The teacher education institutions must make available the necessary consultant services, opportunities for curriculum study under optimum conditions as in summer workshops, and the direction of special research as it is required. The Council already has taken steps to assume its leadership in the project, through its bulletins and the summer workshop.

Most of the activity in curricular reorganization will be concerned not so much in building new courses as in making more functional those now being taught. Here the courses must be scrutinized in detail. Every topic and process included in the course must be justified in terms of its contributions to present-day mathematical competence. Those that cannot be justified must make way for those that can. We need to collect complete information as to how, and by whom, each mathematical process is used; to see that each teacher possesses this information; to discover which processes are included in our courses and which are not; and to learn how the courses can be organized most effectively to include the new materials and discard that which is nonfunctional.

Clearly this is a long-term project in curriculum construction and experimentation that will challenge the combined efforts of all three agencies.

WHAT classroom procedures are effective in producing the required competencies? This is not a new question, but the problems that make it crucial are new. How, for example, can we secure achievement by pupils with relatively low aptitude for mathematics who must fill technical positions in the present manpower crisis? How can mathematics be taught so that it is significant and important to girls? How can we make progress in these new problems when many of our best mathematics teachers are being drawn off into the armed forces or industry and not enough properly trained mathematics teachers are left to replace them?

The situation is difficult, but it is challenging rather than hopeless. A wealth of knowledge regarding effective classroom practices is available as soon as an organized procedure is set up to collect it. All experienced classroom teachers have discovered certain devices, teaching aids, or plans of organization and presentation that are effective for certain topics. We need only a plan for interchange of ideas to make these materials available in all schools. The machinery of the Council should be adequate for this purpose.

Classroom practices, moreover, tend to lag behind the scientific knowledge on which they should be based. They should be consistent with scientifically determined facts as to the nature of child growth and development, indi-

vidual differences, and psychology of learning. Actually they cannot keep abreast of scientific study unless the teacher training institutions assume a responsibility for summarizing what is known in each area and pointing out the implications for classroom procedures.

Drill, for example, by whatever name it is called, is still fundamental in learning in mathematics. Yet much of the drill carried on in the classroom today would be more effective if planned in accordance with established facts as to criteria for effective drill procedure. Again, it has long been known that visual aids are useful in reënforcing the learning of practically all pupils and for many pupils represent about the only available avenue of learning. The armed services are making extensive use of every type of visual aid as a means for quick and effective teaching. In the mathematics classroom we have scarcely scratched the surface. Much could be said along the same line of procedures in testing and evaluation, long unit plans of organization, and the like.

One reason for this lag in the past has been that classroom teachers have not been articulate in demanding that teacher education institutions provide active assistance on specific problems. The Council has made an excellent beginning in the plans for a summer workshop, but it should not stop there. There should be continuous service, on specific problems, throughout the year.

EVEN a casual examination such as this reveals the nature and importance of the contributions required from each agency. As the project of reorganization progresses, the details of coöperative procedure will become more clear and greater opportunities for service will develop. But what, it may be asked, of the long-time view of mathematics in the postwar world?

If we are not to win another war only to lose the peace, we must incorporate some far-reaching plans in our thinking. If the mathematical needs of the emergency were quite independent of, or inconsistent with, those of the postwar world, so far as they can be anticipated, then we might have to make a choice between them and postpone our long-term thinking until the immediate task is accomplished. This, fortunately, is not the case. Many of the newer applications that we should be dealing with may be looked upon as permanent. It is safe, for example, to visualize a postwar world in which air transportation will play a major part so that we may readily think of the aeronautical applications, along with many others, as permanently replacing many of our artificial and antiquated applications.

What we must realize is that the emergency did not create the demand for mathematical competence. It merely revealed it. In a period when industry could operate at 60 per cent of capacity and still meet the demands, individual inefficiency due to mathematical illiteracy could be tolerated or escape unnoticed. When it became necessary to mobilize our total manpower, however, the mathematical bottleneck became apparent. The problem in the postwar world will be to prevent its recurrence. The greatest contribution for coöperative reorganizaton of the mathematics curriculum to that end will lie not so much in the results achieved as in the methods developed.

How to work effectively with a free interchange of information; how to set up procedures for securing required information; how to utilize effectively the services of other agencies in the field—these techniques will be indispensable when we are free to set up a postwar program to achieve universal mathematical literacy.

Using Japanese Teachers in Relocation Centers

By ARTHUR G. RAMEY

Mr. Ramey suggests that the experience of training Japanese evacuées as teachers in the relocation centers throws light on various phases of the teacher training procedure. His article is of interest to teachers, also, because someday we are going to be faced with the problem of evaluating work done in the relocation schools and of assigning credit to it—for the Japanese will be returning to the regular schools of the State, and they will be wanting us to issue them their high school and junior college diplomas inasmuch as the center schools are to be only temporary institutions, from which a diploma will be relatively meaningless.

Mr. Ramey is supervisor of student teachers at the Tule Lake Project, Newell, California. Formerly he taught in Beverly Hills and in Los Angeles. In the latter city, he had an opportunity to work with teacher training while at Emerson Junior High School and University High School, both teacher training centers for the University of California at Los Angeles.

TEACHER training in a Japanese relocation center is unusual in many ways. It has never been done under such circumstances and in the same way before, nor probably will it ever be again. Yet there are aspects of the experience that have interesting implications for educators. This description is based on the work at just one center, the Tule Lake Project in California, but exchanges of information between centers indicate that the programs at all centers are basically similar.

The purpose of the teacher training program here is not primarily to train young people for the profession of teaching. In essence, it is an in-service program to meet immediate needs. It grew originally out of a realization of the difficulty of obtaining a complete staff of trained teachers for these relocation schools, it being found necessary for the evacuees to fill a portion, at least, of the teaching positions.

Another consideration was that teaching would provide a suitable temporary occupation for some of the people who, by education and interests, inclined in that direction. A third factor was the liaison value of having Japanese teachers acting as intermediaries between the Caucasian school staff and the community. The Japanese-American teachers, it was thought, could help the Caucasian teachers gain a better understanding of their pupils and of community problems, and they could help interpret the school to the community. This point was felt to be especially important under these conditions of sudden resettlement and of social tension.

The internship might certainly lead toward teaching as an occupation, but most of the Japanese-Americans do not anticipate a future in that field. A few, however, had already been preparing themselves for teaching before being sent to the centers; and a few others, as a result of their experiences here, are planning to explore the possibilities of teaching as a career.

WHEN the junior-senior high school opened in September, 1942, with an enrollment around 2,400,

evacuee teachers were handling 45 per cent of all classes. As more Caucasian teachers have been obtained, the ratio has decreased; but in February, 1943, Japanese-Americans were still in charge of 30 per cent of the classes. This certainly is not the usual way of introducing student teachers to the job. These people were suddenly plunged into a schedule of five periods a day, in most cases, with little opportunity to think about *what* they were going to teach, let alone *how*.

Of the thirty-eight handling full teaching loads, nineteen had bachelor's degrees; the others had varying amounts of college training. Most of the non-college graduates were in charge of classes like shop and physical education; but in some cases, it was necessary to assign them temporarily to academic classes. The number of these student teachers with full teaching responsibility, which is decreasing steadily, was twenty-five in February.

In addition to these student teachers, we have assigned an assistant teacher to each regular teacher, Caucasian and evacuee alike. The college training of assistants is two years on the average. Their functions are chiefly to assist the teacher with routine classroom procedure, to aid in correcting papers, to aid the teacher in relations with pupils and parents, to give extra help to individual students, and, for those who are capable, to help with some of the classroom teaching. Although assistants were not given their positions to be trained as teachers, our having them has given us a ready source of partially trained people to fill the gaps left by the relocation of student teachers and to serve as substitutes in emergencies.

It is apparent from this brief description of the organization that the process of teacher education has been one of learning by doing, with a vengeance. Not only were these young people doing their first teaching, they started doing it without blackboards, without textbooks, without even enough desks and chairs for all their pupils. Fortunately, they were working with a coöperative group of students, and classes started more smoothly than we had a reasonable right to expect.

THE training program, at first, was concerned with helping these inexperienced teachers get their classes and their work organized. Then as the school got into a more normal channel, and essential equipment having arrived, the program began to assume more definite shape.

Classes were visited regularly by the supervisor of student teachers who assisted in instructional problems and gave guidance and encouragement. The student teachers met with their supervisor in group conferences on Saturday mornings, and they conferred with him individually on the average of once a week. They turned in weekly teaching plans which were criticized for the purpose of improving instruction and for broadening their concept of the teaching process. As a unifying source of educational guidance, each member of the group was supplied with a copy of *Student Teaching*, by Raleigh Schorling.[1]

For a number of reasons, we were more concerned with immediate problems than with theoretical background. The student teachers were deeply immersed in doing the job; they had little extra time for additional meetings or reading; and most of them were not planning to continue in the educational profession. Nevertheless, along with giving them help with their pressing problems, we developed for them the following rather basic outline of educational background:

1 McGraw-Hill Book Company, Inc., 1940.

I. Objectives of education.
II. Understanding your students.
III. Planning your teaching.
IV. Routine and classroom management; discipline.
V. Teaching procedures.
VI. Evaluation.

These points were developed for the most part by lecture and discussion in the weekly conference, by assignments directly related to their teaching, and by related reading in Schorling.

Contributing also to their educational growth were individual consultations with other teachers, work on curriculum committees, attendance at weekly faculty meetings, and a one-week institute held during the Christmas vacation period. In two departments, physical education and shop, there are special supervisors who assume much of the responsibility for the training of the evacuee teachers.

MANY of the problems of this teacher training program already have been made apparent: the lack of educational background and occupational motivation, the heavy teaching load for student teachers, the physical limitations of buildings and equipment, and the rapid turnover of personnel.

As to this last point—the number of evacuee teachers in full charge of classes has averaged around thirty-two. Twenty-three replacements in these positions were made betwen September, 1942, and February, 1943. Most of those replaced left the center to continue their education or to take jobs outside. Some changed to other jobs in the project which would provide more direct training for their future occupations. A few found that they could not adjust themselves to teaching. This number, however, has been surprisingly small, especially when it is considered that there were many less exacting positions on the project with the same remuneration.

The abnormal social and economic situation also has created some difficulties. It has been hard for many of the high school students to adjust themselves readily to the new conditions, a fact which complicates the job of any teacher, and especially so for an inexperienced one. Then, too, the evacuee teachers also have been affected, in varying degree, by psychological upset or tension. This has led to some temporary personal problems and has necessitated gentle, understanding supervision.

Economically, there is no driving incentive for these people to work. The basic needs of the people are taken care of; the amount of extra money they earn is small, and there is little promotional opportunity. However, the teaching group has been motivated by the desire to serve, to further their own learning, and to have a suitable occupation while they are here.

The progress in teaching ability made by these student teachers cannot, of course, be measured; yet it is apparent to those who have been close to their work. The greatest change has been from concentration on subject matter to a growing attention to the problems of individual growth of the student. This latter concept was entirely new to most of the student teachers. They were just out of college; they were good students, engrossed in their own particular majors; they had no background in educational courses. Their initial tendency was to pour their learning into the mass of young humans who confronted them, and woe be unto those who did not absorb it. But as they had not developed resistance to change, they modified their approach rather quickly.

Lesson plans caused most of the student teachers much difficulty. They could easily list the content of their teaching, but not so readily the pro-

cedures. This was due primarily to their lack of knowledge of the diversity of approaches, types of lessons, and variety of techniques. Also, when they were teaching five classes a day, it was hard for them to find time enough to make entirely adequate plans. Some of them developed excellent skill, but, in general, planning is still their weakness.

Gradually they have learned more and sounder teaching techniques, but there seems still to be considerable lack of understanding of basic educational principles and theory. In a seminar discussion with six of the student teachers who were doing excellent teaching, we attempted a review discussion of the five major topics of the outline mentioned above. The purpose was to synthesize their practical experience with this background material and to develop certain generalizations. In the discussion they continually referred to minor aspects and to concrete situations rather than stating any broad principles or conclusions. This was found to be typical of the entire group of student teachers.

The student teachers' problems of discipline have not been as great as might be expected under the circumstances. This may have been due largely to the type of students, but there is another factor which has contributed to it. Most of the student teachers seemed to approach their teaching as just another job to be done. They were not as heavily burdened with doubts, inhibitions, and complexity of educational theories as is many a novice teacher who has gone through the regular teacher training process. They were, therefore, poised and clear in the course of action to be taken, even if such action were not always in line with the soundest educational theory.

They have had their problems, but very few where they did not have the situation well in hand. They have experienced some difficulty in preventing undue familiarity, unpleasant personal remarks, and expressions to the effect that the students want a *real* teacher. Anyone who has worked with student teachers will recognize that these are not unusual problems, but they are harder to control when a supervising teacher is not present to combat them. Our student teachers have overcome this handicap, for the most part, by their sincere devotion to the work and to the interests of the students.

FROM such a relatively small group and with so many complicating social factors, definite conclusions cannot be drawn. However, the experiences in this relocation center may throw light on some phases of teacher training. The readiness with which assistant teachers have been able to take over teaching assignments demonstrates the value of previous contacts with class work, even in minor capacities.

The common tendency of untrained teachers to teach as they have been taught has been illustrated again here. In the absence of fixed ideas and habits, modifications in point of view are quickly made, but the development of proficiency in teaching techniques takes time. Even more time and study are required for beginners to understand basic principles and theoretical background. With a less crowded schedule of teaching, a training teacher to work with them daily, and collateral study and reading, there is no reason why the student teachers could not have developed coördinately in theory and practice.

These novice teachers have showed that application and sincerity overcome many handicaps of youth and inexperience. Above all, they have demonstrated that intelligent, conscientious, college-trained Americans can rise above many limitations to carry on the high traditions of the public schools.

Use of a Rating Scale in A Junior College

By LEO P. KIBBY

Guidance people long have experimented with and used various types of rating blanks. But there always has been at least one weakness with rating procedures—the fact that too often ratings are accumulated without any provision being made for their use. What makes the accompanying article so worth-while, therefore, is that it describes not only the measuring instrument developed but also the extensive provisions made for utilizing the data collected.

Dr. Kibby, who writes the article, is vice-principal and dean of guidance at the Ventura Junior College. Before taking this position, he had been dean of men at Ventura Junior College. He also has been a teaching fellow at the University of Southern California; for four years he taught at the New Mexico State Teachers College, and for two years he was headmaster of the Flintridge School for Boys in Pasadena.

IT is recognized, generally, that a sound guidance program depends on the use of a variety of instruments of measurement. No longer is it assumed that the use of any single factor—for example, grades or the intelligence quotient—is a valid criterion upon which to base a guidance program.

In recent years much emphasis has been attached to the use of rating scales as instruments of measurement. Such emphasis may be due partially to the fact that in the use of rating scales a subject may be rated not only by others but he is able also to rate himself. Acting upon the assumption that a rating scale would be useful in the guidance program at the Ventura Junior College, a committee of five instructors at the Junior College proceeded to construct one.

Specifically, the scale was to be used by teachers in rating students in their classes (see the accompanying rating form) and, with appropriate modifications in instructions, by students as a self-rating device. Later the scale, with the deletion of the traits "Attendance," "Conduct," and "Courtesy," was used by the Ventura Union High School District as a teacher rating instrument.

TWENTY characteristics were selected by the committee to be used in the rating scale. In those instances where the committee felt that clarification of the characteristic was essential, an explanatory word or phrase was added in order to assure more uniformity in the interpretation given by judges. Ratings were to be made on a seven-point scale ranging from *low* to *high* for each characteristic listed. According to the instructions appearing on the blank, the person rating was urged to score the subject on as many of the characteristics listed as he was in a position to judge; furthermore, he was to assign one or two points for an unsatisfactory rating, four points for an average rating, and seven points for an exceptionally satisfactory rating.

Space was provided on the rating scale for the name of the student rated, the class in which he was registered, the name or number of the person doing the rating, and the date on which rating

Name of person rated _____ 11, 12, 13, 14 Sp. _____ Name or number of person rating _____ Date _____

Please rate the above student on as many of the characteristics listed below as you feel you are in a position to judge. Obviously, the greater the number of ratings the more complete are the data on each student. Please check the number you consider appropriate and assign 7 points for an extra satisfactory rating, 4 points for an average rating, and 1 or 2 points for an unsatisfactory rating.

Attendance	1 Poor	2	3	4	5	6	7 Excellent
Conduct (In class and on school campus)	1 Disturbing	2	3	4	5	6	7 Pleasant
Preparation (In subject matter)	1 Poor	2	3	4	5	6	7 Excellent
Appearance (In dress)	1 Untidy	2	3	4	5	6	7 Well-groomed
Reliability	1 Deceitful	2	3	4	5	6	7 Truthful
Industry	1 Poor effort	2	3	4	5	6	7 Hard worker
Scholarship	0 F	1 D	2	3 C	4	5 B	6 7 A
Leadership	1 Follower	2	3	4	5	6	7 Takes initiative
Interest (In school and everyday affairs)	1 Passive	2	3	4	5	6	7 Active
Citizenship (Attitude toward school & civic affairs)	1 Poor	2	3	4	5	6	7 Excellent
Health (Physical)	1 Poor	2	3	4	5	6	7 Excellent
Originality	1 Non-creative	2	3	4	5	6	7 Creative
Judgment	1 Poor	2	3	4	5	6	7 Excellent
Poise (Mastery of a situation)	1 Poor	2	3	4	5	6	7 Excellent
Speech (English, diction)	1 Poor	2	3	4	5	6	7 Excellent
Social adjustment (A mixer—or isolates himself)	1 Isolated	2	3	4	5	6	7 Good mixer
Accuracy (In school work completed)	1 Poor	2	3	4	5	6	7 Excellent
Cooperation (Suggestive or helpful)	1 Poor	2	3	4	5	6	7 Very helpful
Courtesy	1 Rude	2	3	4	5	6	7 Polite
Punctuality (Prompt or negligent)	1 Negligent	2	3	4	5	6	7 Prompt

Since requests are often received from universities, employers, etc., asking for complete personal information about a student, will you please make a statement which may be incorporated in a general letter of recommendation. Such information is confidential.

_____

_____

_____

_____

PLEASE RETURN THIS FORM TO THE OFFICE OF THE DEAN OF GUIDANCE.

was made. All instructors were assigned a code number which they might use if they preferred not to sign the rating blank. Space was available, also, in which instructors were to make a statement about the student which could be incorporated in a letter of recommendation.

The rating blank was printed and distributed to each member of the faculty. At some time during the year all instructors are expected to rate each student they have had in class at least once. If a student drops out of school, a rating of him is to be made immediately. All ratings later are placed in the individual student's permanent folder on file in the Registrar's Office and become available for counseling purposes. As a student progresses in school, additional ratings assist in providing a more accurate and varied account of his personality and qualifications.

Each year all new students entering the Ventura Junior College are given the student rating blank and are asked to rate themselves on the characteristics listed. A composite score then is obtained for each student by totaling the sum of the numbers he has checked in each column. The total score then is divided by the number of characteristics checked in order to reduce the total score to the scale used for measuring a specific characteristic.

When these individual ratings are grouped, there appears a curve roughly approximating the normal. Counselors have such distribution curves available and thus are able to observe the position where an individual student's self-rating score falls. Admittedly, difficulty may be experienced in determining what meaning is to be attached to such a relative position, yet the measurement of any trait, for example, intelligence, is effected on a comparative basis and has meaning only when judged in relationship to some other measurable characteristic.

REPORTS by counselors indicate that a particular student's position on the group scale assists in determining the extent to which such student has self-confidence. If a student's self-rating score approaches the *excellent* end of the scale, he appears to have a high degree of self-confidence. As scores decrease, students tend to have less and less confidence in themselves. Additional information is furnished, likewise, by means of the rating reports of the faculty. When extreme differences or discrepancies appear between the student's self-rating and the faculty's rating of him, counselors become cognizant of a possible problem area in the student's experience which may need attention.

Another advantage of this particular rating scale for counseling purposes may be found in the use which may be made of the separate items or characteristics which appear on the scale, in addition to the use of the composite score. Where ratings appear low on the scale for any characteristic, the counselor may advise the student more accurately. The student, in turn, by becoming more conscious of his weak points, is in a position to concentrate on methods of improvement.

Mills College Offers Scholarships

Casa Pan Americana, Mills College center of Latin-American studies, announces the availability of twenty scholarships for the 1943 summer session, June 28 to August 7. Ten of the scholarships will be awarded to Latin-Americans and ten to North Americans. Applicants should write for blanks, addressing the director of the Summer Session, Mills College, Oakland.

A Guide to Opportunities for Summer Study

At the University of California

THE University of California announces the institution of a new type of summer session within the framework of an enlarged division of University Extension.

The 1943 Summer Sessions will be held on the Berkeley and Los Angeles campuses for the six weeks beginning June 28 to August 6 inclusive.

The Summer Sessions will be open, as usual, to all high school graduates and to others over 21 years of age who are able to profit by the instruction offered. The courses have been selected with special reference to their suitability for specialized study and adult learning within the wide variety of fields represented in the University curriculum.

Numerous features have been planned to meet emergencies which have arisen because of the war effort. Teachers who have been called to fill vacancies in fields unfamiliar to them can secure the training they need; some high school graduates will need to complete matriculation requirements; certain students who are candidates for degrees in the regular curriculum and who are

Today As Never Before

Teachers Throughout the Nation Are Alert

To meet the unprecedented responsibilities—and opportunities—within their vocational calling. With this in mind, the University of California Summer Sessions are wide in scope, typifying the magnificent spirit of the people in their co-operation with the vital issues of war. Every effort has been made to offer courses which will contribute to this larger plan of fulfilling the present emergency requirements of adaptation and change while yet looking ahead with foresight into the future's needful program of reconstruction.

Open as usual to all high school graduates and others over 21 years of age who are able to profit by the instruction offered, Summer Sessions begin on June 28 and continue until August 6 on the Berkeley and Los Angeles campuses. Needs of matriculation students, as well as of those candidates for degrees in the regular curriculum, have been met with a wide variety of courses in fields represented in the University course of study.

Summer Sessions students will not be required to submit transcripts of record nor meet the formalities of the 16-week 1943 Summer Terms, also being offered on the Berkeley and Los Angeles campuses. For the Bulletin of Summer Sessions, containing the complete announcement of courses, fees and other expenses, address: Director of Summer Sessions, 222 Administration Building, University of California, Berkeley, or 242 Administration Building, University of California, Los Angeles.

UNIVERSITY OF CALIFORNIA SUMMER SESSIONS

Berkeley and Los Angeles

June 28 to August 6

unable to attend the full sixteen-week term will find the Summer Sessions offering adequate to their needs.

The 1943 Summer Sessions will run concurrently with the new sixteen-week Summer Terms offered on both campuses, which will be open only to students who have met the formal admission and residence requirements. Summer Session students will not be obliged to meet these formalities, nor to submit transcripts of record.

For the *Bulletin of the Summer Sessions,* containing the complete announcement of courses, information concerning the duties and privileges of students and auditors, and fees and other expenses, write to the Summer Sessions Office, either 222 Administration Building, University of California, Berkeley, or 242 Administration Building, University of California at Los Angeles, Los Angeles, California.

At the University of British Columbia

ONE of the probable results of the war is a greater degree of intermingling among the teachers of the United States and Canada. It is to be expected, for example, that an increasing number of British Columbia teachers will attend the summer sessions of the Universities of the American Pacific Coast, and it may be that some American teachers will wish to attend the Summer Session of the University of British Columbia at Vancouver, B. C.

Canada has been at war for over three and a half years. This has caused some curtailment of the Summer Session program. Nevertheless, the University will offer in the summer of 1943 one or more courses in each of the fields of Biology, Chemistry, Economics, Education, English, French, Geography, History, Mathematics, Philosophy, Psychology, Physics, and Social Work.

Visiting professors will be H. G. Townsend, University of Oregon, and F. M. Quance, University of Saskatchewan.

The dates of the Summer Session are June 28 to August 13. A descriptive bulletin will be sent on application to the Registrar, University of British Columbia, Vancouver, B. C.

At Whittier College

THE 1943 Whittier College Summer Session will continue, as in past years, to give courses on both its Whittier campus and its Pasadena campus (Broadoaks School of Education, Whittier College).

Important additions to these established facilities have been arranged for the 1943 session in both Whittier and Pasadena. Chapman College of Los Angeles, now temporarily located in Whittier as an institution associated with Whittier College, will coöperate with and take part in the summer session in Whittier. In Pasadena, the Pasadena Playhouse Association and Whittier College are collaborating in a summer session in the social sciences, the courses to be given by Whittier staff members at the Pasadena Playhouse in downtown Pasadena. These new arrangements will make it possible for individuals in widely separated areas to avail themselves of Whittier Summer Session courses with maximum convenience and at the same time secure them under conditions of a varied professional background.

The courses offered in the 1943 Summer Session will emphasize teacher preparation and the social sciences, with a balancing number of courses being offered in the exact sciences. At Whittier, courses in history, political science, economics, and philosophy will be given in connection with the ninth annual Whittier Institute of International Re-

lations. The Institute will bring to these classes as special lecturers, Dr. Peter Drucker, economist and professor at Bennington College, President Arthur E. Morgan of Antioch College, and former chairman of T. V. A., Professor Howard Thurman of Howard University, Haridas Mazumdar, native of and specialist on India, and others. These courses will be specifically addressed to the problem: What is the nature of the present crisis and what opportunities does it present? This work will be at the upper division or graduate level.

It is possible for individuals to attend the summer session for the period of the Whittier Institute only, July 7 to July 17, enroll in a daily college credit seminar for the same period, and earn two college credits.

Whittier will continue to offer lower division courses in the summer session so that high school graduates can enter beginning college classes in June instead of waiting until September and thus hasten the completion of their college course.

The first term of six weeks is from June 21 to July 30; the second term of four weeks, from August 2 to August 27. Courses at the Pasadena Playhouse and certain lower division courses at Whittier will be in session until September 3. There are no courses available during the second term at the Broadoaks School of Education.

At the College of The Pacific

KEY to accelerated training at the College of the Pacific in Stockton is the extension of summer study schedules. For 1943, two independent sessions of five weeks each have been announced by Dean J. Marc Jantzen. The first extends from June 14 to July 16, and the second from July 19 to August 20. Both will be held on the Stockton campus, the traditional Lake Tahoe section being set aside under present circumstances.

All courses will be completed during the section in which they are introduced, but attendance throughout both periods will net as much as twelve and one-half units of credit in the lower division, upper division, or graduate levels. The ten weeks are equivalent to a regular semester of graduate work for credential candidates.

For qualified A. B. candidates, three regular semesters and ten weeks of summer work are sufficient for completion of all upper division requirements. A student with junior standing now can save half a calendar year before receiving his degree by utilizing the full summer program.

Lower division offerings in science, English, history and political science, mathematics, music, physical education, and speech are catalogued for the session. Any qualified high school student will find freshman courses in English, speech, and mathematics available.

Upper division and graduate work will be found in all of the above fields, plus religious education, philosophy, education, educational psychology, and art.

During the first term, science courses designed to qualify high school teachers to instruct in aeronautics on the secondary level will be offered by Dr. I. Paul Maizlish, teaching for the first time in Pacific summer sessions. Dr. Maizlish has come to the College of the Pacific with extensive university teaching and practical scientific experience behind him. Recently he has taught aeronautics at the United States Army Air Base in Santa Ana, the United States Basic Flying School of Lemoore, and at the Rankin Aeronautical Academy. Previously he has taught at the Massachusetts Institute of Technology, University of Iowa, University of Minnesota,

and Leheigh University. In the Pacific Summer Session he will head courses in meteorology, navigation, aerodynamics, and astronomy.

Science offerings in the second section will be in the zoölogy field with Dr. Alden Noble teaching heredity and evolution, physical anthropology, and ornithology.

In education all courses leading to California secondary and administrative credentials will be offered by outstanding men working in the field. Thomas W. Chapman, assistant superintendent of the Lodi School system, will head the work in secondary administration.

Chapman will instruct for the first five-week period, while the same field will be directed for the second section by Harold Chastain, district superintendent and dean of the Junior College in the Placerville Union High School and Junior College District.

Complete bulletins describing all course offerings and exhibiting all information about tuition costs and accommodations may be ordered by addressing the Office of the Registrar.

MILLS COLLEGE
SUMMER SESSION
FOR MEN AND WOMEN
June 28—August 8, 1943
Courses of Study Significant in Wartime with Undergraduate and Graduate College Credit

1. **Casa Pan Americana**
   Staff of distinguished Latin-Americans. Workshops and seminars. Also language studies.
2. **La Maison Francaise**
   Staff of guests headed by André Maurois, eminent French writer.
3. **English Institute**
   Training for persons planning to teach English to non-English-speaking peoples.
4. **Foreign Areas Studies**
   Language and background in: Chinese, Japanese, French, Portuguese, German, Russian, Italian, Spanish.
5. **Production Illustration**
   ESMWT course under U. S. Office of Education. Training for skilled war employment.
6. **Creative Arts**
   Music: Staff includes Darius Milhaud. Arts and Crafts with José Perotti, noted Chilean painter and sculptor, William Gaw and F. Carleton Ball.
7. **Education for Family and Community**
   Family Life Education Workshop—Dr. Paul Popenoe and Mrs. Frances Bruce Strain.
   Child development program.
8. **Institute of International Relations**
   10 days: June 27 to July 7.

Address: Dean of Summer Session, Mills College • Oakland, California

At Mills College

COURSES of study significant in war time are included in the announcement of the Mills College Summer Session which will be held during the six weeks from June 28 through August 7, 1943.

High-lighted this year are the continuation of the program of Latin-American studies so successfully presented last summer in the Casa Pan Americana and the studies in French history and culture carried out in the atmosphere of La Maison Française. Two new groupings will be introduced: the Foreign Areas Studies will present the language and culture background studies of foreign areas involved in the present war and the reconstruction which will follow, and an English Institute will afford specialized training for persons planning to teach English to non-English-speaking peoples, with practice in teaching English to foreign exchange students. There will be also a war training course in production illustration, sponsored by the U. S. Office of Education, to prepare for immediate skilled employment in aircraft and shipbuilding industries.

Creative arts—music, art, and crafts, with daily children's classes—and education for family and community, both so successfully stressed last year as in other seasons, are to have important places in the six weeks' curriculum. Concentrated programs are on the schedule for Family and Community Education, Rorschach Testing Workshop, and Campfire Girls Executive Training School.

For the eleventh season La Maison

Française will create for students of French history, language, and culture a perfect atmosphere wherein to enjoy six weeks of study and recreation with a staff headed by M. André Maurois, member of the French Academie, author and lecturer whose writings and lectures are known the world around. Dr. A. Cécile Réau, professor of French and convenor of the School of Language and Literature at Mills, again will be the director of the Maison, with Dr. Elizabeth Creed, Mme. Madeleine Milhaud, and others, assisting.

Students, faculty, French scholars and guests who live in La Maison Française during the summer enjoy an unique experience in what is recognized as one of the centers of French studies in the United States.

The second year of the Casa Pan Americana will be observed this year with a distinguished faculty and program devoted to Portuguese and Latin-American history and language studies.

Heading the Portuguese staff will be Dr. Hernane Tavares de Sá, leading scientist and writer of Brazil, who has been touring the United States during the last twelve months studying high school and college educational systems. Dr. Tavares de Sá is a member of the faculty of the University of Sao Paulo and is author of a recently widely read book, *Dear Neighbor—Here Is Brazil.* He will head the program of Portuguese language and studies in Brazilian history and culture and will be assisted by Miss Pilar Ferrer, exchange student from Sao Paulo.

Dr. Arturo Torres-Rioseco of Chile, leading authority on Latin-American literature and author of many books, latest of which is *Epic of Latin-American Literature,* will direct the studies in his field, while Dr. Jiminez Borja, member of the faculty of the University of San Marco, Lima, Peru, oldest university in the Western Hemisphere, will teach Latin-American History and Cultures.

In addition, there will be a daily seminar for teachers working in curriculum problems in teaching Spanish and Latin-American studies on the elementary and secondary school levels. This seminar will be conducted by representatives of the United States Office of Education, the coördinator of Inter-American affairs, assisted by Miss Ruth Franklin, director of Latin-American studies in the San Francisco schools.

In the studies of Education for Family and Community, a Family Life Education Workshop will be sponsored by the American Institute of Family Relations, for three weeks, from June 28 to July 17, with Dr. Paul Popenoe, Mrs. Frances Bruce Strain, Dr. Robert Foster, and others comprising the staff.

June 27 through July 7 are the dates announced for the ten-day session of the Institute of International Relations, an annual institute on Mills campus for a number of years. Lectures and round-table discussions by recognized authorities on present and future world problems constitute a program for which college credit may be earned.

All of the Summer Session work is open to both men and women, undergraduates, and graduate students, as well as to those seeking to meet requirements for special credentials or taking the summer course for sheer enjoyment. Dr. John Harvey Furbay is director of the Summer Session.

At Stanford University

THE United States is massing its forces for victory on the battlefields of the world. Military preparation, production, civilian supply, and many other activities are making demands on the school to train workers and fighters, to strengthen morale by defining the issues of the war and the democratic goals to be achieved and to

raise standards of health and general well-being amidst a growing shortage of raw materials, food, and manpower.

To meet these demands, teachers and administrators are required to reorganize some courses, to add new ones and to drop others. They must cope with the confusions and anxieties of young people and adults and assume many new community responsibilities. There is good reason to believe that teachers and educational workers can best fight the rise of living costs, that they can best improve their professional standing, that they can best contribute to the winning of the war and the advancement of the principles of democracy by staying on their jobs in this period of international emergency.

In other words, it is patriotic for teachers to improve their professional training, to attend summer school when they are assured that they can utilize their summer's training to strengthen the rôle of education in their communities.

To assist educational workers in adjusting the school program to the needs of the emergency, the Stanford School of Education has set up its program for the summer of 1943 in workshop organization, as well as in individual courses.

In an eight-weeks' summer session opening June 17 and closing August 14, the School of Education will offer five individual workshops to deal with the particular problems facing education in this emergency period. They are as follows: (1) Communications Workshop (laboratory work in the Communications Center for secondary school students)—4-16 units; (2) Elementary Education—2-16 units; (3) Mathematics Curriculum and Instruction (in coöperation with the recently formed California Mathematics Council)—4-16 units; (4) Science Teaching in the War—4-16 units; (5) Social Education for Victory and Postwar Reconstruction (in coöperation with the Stanford Social Education Investigation)—0-16 units.

In regular class work adequate offerings are available to suit the individual requirements of students who are completing the requirements for degrees and credentials or who are studying specific problems created by the emergency. In general, these courses fall into four major areas:

1. Basic and advanced courses are available in psychology, evaluation, history and comparative education, philosophy of education, educational hygiene, educational sociology, educational measurement, and statistics.

2. A very adequate offering is available in the general and specialized aspects of curriculum and instruction and guidance. For the first time this summer, we are offering observation and teaching on the nursery school level.

3. The summer quarter program recognizes the special problems of the administrator in the emergency by offering six courses in administration.

4. Research seminars and individual study for students completing the requirements for the master's or doctor's degree also are available.

Summer Quarter bulletins will be mailed in answer to requests addressed to the Registrar, Stanford University, California. Answers to specific questions not found in the printed materials may be addressed to the dean of the School of Education, Stanford University.

Students new to the University are encouraged to apply for admission prior to the registration day, which is June 17.

OWI Wants School Projectors Used During Summer

The Office of War Information requests that schools make use of their 16-mm. sound projectors during the 1943 summer by taking the projectors into war plants and making them available to plant managers and labor organizations.

CALIFORNIA SOCIETY OF SECONDARY EDUCATION

INCORPORATED UNDER THE LAWS OF CALIFORNIA AS A NON-PROFIT ORGANIZATION

SUSTAINING MEMBER OF THE SOCIETY

MILTON NEWMARK, Attorney at Law, Crocker Building, San Francisco.

LIFE CORPORATE MEMBERS

(Limited to 100. Fee $50.00)

DR. ETHEL PERCY ANDRUS, Principal, Abraham Lincoln High School, Los Angeles.

ARNOLD C. ARGO, District Superintendent, Sequoia Union High School, Redwood City.

R. F. ASPINALL, Principal, Edison Technical Junior-Senior High School, Fresno.

WAYNE F. BOWEN, Compton City Schools, Compton.

DR. H. B. BROOKS, Principal, George Washington Junior High School, Long Beach.

CAPT. DELBERT BRUNTON, Sanger.

ARCHIBALD J. CLOUD, President, San Francisco Junior College, San Francisco.

AUBREY A. DOUGLASS, Assistant Superintendent of Public Instruction, State of California, Sacramento.

WILLIAM F. EWING, City Superintendent of Schools, Oakland.

DR. L. P. FARRIS, Principal, Oakland High School, Oakland.

HARVEY H. FERRIS, Principal, Weed High School, Weed.

DR. LOWELL C. FROST, Head of Science Department, Beverly Hills High School, Beverly Hills.

GEORGE H. GEYER, Director, Glendale Junior College, Glendale.

ROBERT R. HARTZELL, Principal, Red Bluff Union High School, Red Bluff.

ANNIE G. HARVEY, Fresno.

ARTHUR C. HEARN, Principal, Gilroy Union High School, Gilroy.

DR. WALTER R. HEPNER, President, San Diego State College, San Diego.

CLARENCE G. HERKNER, Principal, San Rafael Grammar School, San Rafael.

DR. C. L. HUGHES, Assistant Professor of Education and Associate Director of Practice Teaching, University of California, Berkeley.

ZELMA L. HUXTABLE, Teacher of Social Studies, Woodrow Wilson Junior-Senior High School, Los Angeles.

FERDINAND J. LAPEYRE, Teacher of Arithmetic and Shop, High School of Commerce, San Francisco.

J. R. MCKILLOP, District Superintendent of Schools, Monterey.

RHODA MCRAE, Teacher of Social Studies, Roosevelt High School, Oakland.

ATTILIO G. PARISI, Attendance Officer, Central Junior High School, Los Angeles.

F. J. PRIBBLE, Director, Commercial Education, Sacramento Junior College, Sacramento.

DR. WILLIAM M. PROCTOR. (Deceased.)

JESSE E. RATHBUN, Teacher of Woodwork and Mathematics. Presidio Junior High School, San Francisco.

HORACE M. REBOK. (Deceased.)

DR. LESTER B. ROGERS, Dean, School of Education, The University of Southern California, Los Angeles.

MARJORIE NICHOLS SHEA, Vice-Principal, Abraham Lincoln High School, Los Angeles.

DR. CORNELIUS H. SIEMENS, Assistant Professor of Education, University of California, Berkeley.

LEE ROY SMITH, Vice-Principal, San Fernando High School, San Fernando.

DR. ALICE BALL STRUTHERS, Principal, Thomas Starr King Junior High School, Los Angeles.

RUTH G. SUMNER, Teacher of Mathematics, Oakland High School, Oakland.

DR. GEORGE C. THOMPSON, Principal Emeritus, Alameda High School, Alameda.

DR. FRANK C. TOUTON. (Deceased.)

HELEN E. WARD, Principal, Salinas Evening High School and Junior College, Salinas.

DR. FREDERICK J. WEERSING, Professor of Education, The University of Southern California, Los Angeles.

DR. HERMAN P. WINN, Teacher of Mechanical Drawing, Phineas Banning Junior-Senior High School, Los Angeles.

TEN-YEAR TERM CORPORATE MEMBERS

(Sale of Ten-Year Term Memberships discontinued July 1, 1934)

J. WARREN AYER, Superintendent of Schools, Eureka.

A. R. CLIFTON (Deceased).

CORPORATE MEMBERS

Corporate members are entitled to all the professional privileges of the corporation, to bulletins, periodicals, and reports published by the corporation, and have the right to vote and to hold office. The annual membership fee for corporate members is $5. With the payment of annual dues, members discharge all financial obligations as members of the Society.

JOHN ASELTINE, Principal, San Deigo Senior High School, San Diego.

G. J. BADURA, Principal, Fortuna Union High School, Fortuna.

W. D. BANNISTER, Principal, Oxnard Union High School, Oxnard.

GRACE VAN DYKE BIRD, Dean, Bakersfield Junior College, Bakersfield.

FRANK E. BISHOP, District Superintendent, Corona.

ROSA L. BLOXHAM, Sequoia Union High School, Redwood City.

DR. JESSE A. BOND, Department of Education, University of California at Los Angeles, Los Angeles.

RICHARD WARNER BORST, Head of English Department, Fullerton Junior College, Fullerton.

JOHN M. BOWERSOX, Principal, Eureka Evening High School, Eureka.

OLIVER E. BROWN, District Superintendent of Schools, Gilroy.

MRS. FLORENCE H. BUCK, Librarian, Robert Louis Stevenson Junior High School, Los Angeles.

BERNICE BUDLONG, Supervisor of Domestic Arts, City Schools, San Jose.

DR. JAMES F. BURSCH, Deputy Superintendent of Schools, Sacramento.

KATHARINE L. CAREY, Assistant Superintendent of Schools, Los Angeles.

A. L. CAULKINS, Registrar, Stockton High School, Stockton.

MRS. HELEN REYNOLDS CHAMBERLIN, Glendale High School, Glendale.

EDWIN CLARK, District Superintendent, Reefe-Sunset District, Avenal.

A. O. COOPERRIDER, Principal, Arcata Union High School, Arcata.

WILLIAM P. CRAMSIE, Principal, Peter H. Burnett Junior High School, San Jose.

JAMES P. DAVIS, Principal, San Benito County High School, Hollister.

DORIS DOZIER, Secretary of Placement, Mills College.

DR. HIRAM W. EDWARDS, Director of Relations with Schools, University of California at Los Angeles, Los Angeles.

W. FRED ELLIS, Principal, Stockton High School, Stockton.

MARGARET H. ERDT, Supervisor of Art, City School Department, San Bernardino.

DR. ALVIN C. EURICH, Standards and Curriculum, U. S. Navy, Washington, D. C.

SAMUEL L. FICK, Secretary, California Industrial Education Association, Los Angeles.

DR. FRANK M. FREEMAN, Dean, School of Education, University of California, Berkeley.

MARGARET GIRDNER, Supervisor of Texts and Libraries, San Francisco.

ARTHUR GOULD, Deputy Superintendent of Schools, Los Angeles.

B. H. GRISEMER, Principal, Porterville Union High School and Junior College, Porterville.

MRS. E. T. HALE, President, California Congress of Parents and Teachers, Inc., San Diego.

STANFORD HANNAH, Principal and District Superintendent, Taft Union High School and Junior College, Taft.

HARRY G. HANSELL, Principal, Presidio Junior High School, San Francisco.

DR. JOHN W. HARBESON, Principal, Pasadena Junior College, Pasadena.

F. S. HAYDEN, Principal, Citrus Union High School and Junior College, Azusa.

W. T. HELMS, City Superintendent of Schools, Richmond.

CHARLES E. HICKS, Head of Mathematics Department, David Starr Jordan High School, Los Angeles.

DR. MERTON E. HILL, Professor of Education, University of California, Berkeley, and University of California at Los Angeles, Los Angeles.

EDNA J. HOFFMAN, English Teacher, Monterey Union High School, Monterey.

HARVEY J. HOLT, Principal, Santa Barbara Senior High School, Santa Barbara.

CAROL HOVIOUS, Head, English Department, San Benito County High School and Junior College, Hollister.

O. S. HUBBARD, Coördinator of Secondary Curricula, County School Department, San Jose.

E. J. HUMMEL, Deputy Superintendent, Beverly Hills.

DR. GEORGE W. HUNTER, Lecturer in Education, Claremont Colleges, Claremont.

DR. ROSCO C. INGALLS, Director, Los Angeles City College, Los Angeles.

CECILIA ROBERTSON IRVINE, Coördinator of Social Studies, Student Teachers, University High School, West Los Angeles.

GEORGE C. JENSEN, Assistant Superintendent of Schools, Sacramento.

DR. LOAZ W. JOHNSON, Coördinator of Secondary Education, Oroville.

V. BERNARD JOHNSON, Principal, Fall River Joint Union High School, McArthur.

DR. GRAYSON N. KEFAUVER, Dean, School of Education, Stanford University.

DR. W. W. KEMP, Professor of Education, University of California, Los Angeles.

DONALD E. KITCH, Curriculum Coördinator, County School Department, Martinez.

DR. WILLIAM J. KLOPP, Supervisor of Secondary Education, Long Beach.

VERNE S. LANDRETH, Chief, Division of Physical and Health Education, State Department of Education, Los Angeels.

DR. EMIL LANGE, Principal, Hamilton Junior High School, Long Beach.

DR. GERTRUDE LAWS, Director of Education for Women, Pasadena.

OLIVER C. LAWSON, Principal, Garfield Junior High School, Berkeley.

DR. EDWIN A. LEE, Dean, School of Education, University of California, Los Angeles.

EDWARD Y. LINDSAY, Latin Instructor, Grant Union High School, North Sacramento.

T. S. MACQUIDDY, District Superintendent and Principal, Watsonville Union High School, Watsonville.

GEORGE C. MANN, Chief of Division of Adult and Continuation Education, State Department of Education, Los Angeles.

SISTER MARY DOLOROSA MANNIX, Mount Saint Mary's College, Los Angeles.

A. L. MCCARTY, Mathematics Instructor, San Francisco Junior College, San Francisco.

F. L. MCEUEN, Vice-Principal, Polytechnic High School, Riverside.

MARY E. MCGLOTHLIN, Counselor, Stockton High School, Stockton.

JULIAN A. MCPHEE, President, California Polytechnic School, San Luis Obispo.

HOWARD P. MILLER, Western Manager, Charles Scribner's Sons, San Francisco.

HARRY J. MOORE, Principal, Woodrow Wilson Senior High School, Long Beach.

EDITH L. MOSSMAN, Algebra Instructor, Berkeley High School, Berkeley.

MAUDE I. MURCHIE, Chief of Bureau of Home-Making Education, State Department of Education, Sacramento.

EARL MURRAY, General Supervisor, Modoc County Schools, Alturas.

DR. ORVIL F. MYERS, Head of Philosophy Department, Los Angeles City College, Los Angeles.

JULIA M. NEPPERT, Head of Music Department, Lowell High School, San Francisco.

DR. WILLIAM R. ODELL, Assistant Superintendent of Schools, Oakland.

ALBERT C. OLNEY, President, Marin Union Junior College, Kentfield.

J. R. OVERTURF, City Superintendent of Schools, Sacramento.

HOWARD H. PATTEE, California Association of Independent Secondary Schools, Claremont.

IRENE M. PAULY, Vice-Principal, Balboa High School, San Francisco.

SISTER M. FRANCIS RAPHAEL, College of the Holy Names, Oakland.

JOSEPHINE V. RAUSCH, History and Civics Teacher, George Washington High School, San Francisco.

EDWARD H. REDFORD, Editor, California Journal of Secondary Education, Berkeley.

GERTRUDE E. RENDTORFF, Dean of Girls, Monterey Union High School, Monterey.

HARRY SARGENT, Phineas Banning Evening High School, Wilmington (L. A.).

DR. JOHN A. SEXSON, Superintendent of Schools, Pasadena.

CONSUELO W. SEYMOUR, Spanish Teacher, Union High School, Calexico.

DR. WILLIAM A. SMITH, Associate Professor of Education, University of California at Los Angeles, Los Angeles.

HERMAN A. SPINDT, Manager of Bureau of Placement and Guidance, University of California, Berkeley.

ROBERT O. SPRAGUE, Principal, Southwest Junior High School, Nestor.

DR. FLETCHER H. SWIFT, Professor of Education, University of California, Berkeley.

RUTH SWIFT, Vice-Principal, Selma Union High School, Selma.

VERA A. SWOBODA, Gilroy Union High School, Gilroy.

DR. FRANK W. THOMAS, President, Fresno State College, Fresno.

DR. CLINTON C. TRILLINGHAM, County Superintendent of Schools, Los Angeles.

PAUL VANDEREIKE, Instructor, Bakersfield Junior College, Bakersfield.

CURTIS E. WARREN, City Superintendent of Schools, Santa Barbara.

HOWARD O. WELTY, Principal, Technical High School, Oakland.

DR. L. A. WILLIAMS, Professor of Education, University of California, Berkeley.

HELEN L. WIRT, Drama Teacher, Oakland High School, Oakland.

HERBERT S. WOOD, Principal, John C. Fremont High School, Los Angeles.

DR. FLAUD C. WOOTON, Associate Professor of Education and Associate Director of Secondary Training, University of California, Los Angeles.

DR. F. M. YOCKEY, Principal, Technical Evening High School, Oakland.

INSTITUTIONAL MEMBERS

Institutional membership in the California Society of Secondary Education is authorized by action of the State Board of Education in listing the Society under the provisions of Section 2.1520 of Chapter 860 of the School Code. Institutional members receive the CALIFORNIA JOURNAL OF SECONDARY EDUCATION for the library of the school and a copy of the *California School Directory* published in November of each school year. The annual institutional membership fee is $10.

Alameda: ALAMEDA HIGH SCHOOL.

Albany: ALBANY JUNIOR-SENIOR HIGH SCHOOL.

Alhambra:
ALHAMBRA CITY HIGH SCHOOL.
MARK KEPPEL HIGH SCHOOL.

Alturas: MODOC UNION HIGH SCHOOL.

Anaheim: ANAHEIM UNION HIGH SCHOOL.

Anderson: ANDERSON UNION HIGH SCHOOL.

Angels Camp: BRET HARTE UNION HIGH SCHOOL.

Antioch: ANTIOCH HIGH SCHOOL.

Arcata:
ARCATA UNION HIGH SCHOOL.
HUMBOLDT STATE COLLEGE.

Arroyo Grande: ARROYO GRANDE UNION HIGH SCHOOL.

Atascadero: ATASCADERO UNION HIGH SCHOOL.

Auberry: SIERRA JOINT UNION HIGH SCHOOL.

Auburn: PLACER UNION HIGH SCHOOL AND JUNIOR COLLEGE.

Azusa: CITRUS UNION HIGH SCHOOL AND JUNIOR COLLEGE.

Bakersfield:
KERN COUNTY SCHOOL DEPARTMENT, Director of Curriculum.
KERN COUNTY UNION HIGH SCHOOL DISTRICT.

Banning: BANNING UNION HIGH SCHOOL.

Barstow: BARSTOW UNION HIGH SCHOOL.

Beaumont: BEAUMONT HIGH SCHOOL.

Berkeley:
BERKELEY HIGH SCHOOL.
BURBANK JUNIOR HIGH SCHOOL.
GARFIELD JUNIOR HIGH SCHOOL.
MCKINLEY CONTINUATION HIGH SCHOOL.
UNIVERSITY OF CALIFORNIA.
WILLARD JUNIOR HIGH SCHOOL.

Beverly Hills: BEVERLY HILLS HIGH SCHOOL.

Big Creek: BIG CREEK SCHOOL.

Biggs: BIGGS UNION HIGH SCHOOL.

Big Pine: BIG PINE UNION HIGH SCHOOL.

Blythe: PALO VERDE VALLEY HIGH SCHOOL.
Boonville: ANDERSON VALLEY UNION HIGH SCHOOL.
Boulder Creek: BOULDER CREEK UNION HIGH SCHOOL.
Brawley: BRAWLEY UNION HIGH SCHOOL AND JUNIOR COLLEGE.
Brea: BREA-OLINDA UNION HIGH SCHOOL.
Brentwood: LIBERTY UNION HIGH SCHOOL.
Burbank: JOHN BURROUGHS JUNIOR HIGH SCHOOL.
Burlingame: BURLINGAME HIGH SCHOOL.
Calistoga: CALISTOGA JOINT UNION HIGH SCHOOL.
Campbell: CAMPBELL UNION HIGH SCHOOL.
Carmel: CARMEL JUNIOR-SENIOR HIGH SCHOOL.
Carpinteria: CARPINTERIA UNION HIGH SCHOOL.
Caruthers: CARUTHERS UNION HIGH SCHOOL.
Cedarville: SURPRISE VALLEY UNION HIGH SCHOOL.
Centerville: WASHINGTON UNION HIGH SCHOOL.
Chico: CHICO HIGH SCHOOL.
Chino: CHINO HIGH SCHOOL.
Chowchilla: CHOWCHILLA UNION HIGH SCHOOL.
Chula Vista: CHULA VISTA JUNIOR HIGH SCHOOL.
Claremont:
CLAREMONT JUNIOR-SENIOR HIGH SCHOOL.
THE WEBB SCHOOL.
Clarksburg: CLARKSBURG HIGH SCHOOL.
Cloverdale: CLOVERDALE UNION HIGH SCHOOL.
Clovis: CLOVIS UNION HIGH SCHOOL.
Coachella: COACHELLA VALLEY UNION HIGH SCHOOL.
Coalinga: COALINGA UNION JUNIOR-SENIOR HIGH SCHOOL AND JUNIOR COLLEGE.
Colton: COLTON UNION HIGH SCHOOL.
Colusa: COLUSA UNION HIGH SCHOOL.
Compton:
COMPTON JUNIOR COLLEGE.
Concord: MT. DIABLO UNION HIGH SCHOOL.
Corcoran: CORCORAN UNION HIGH SCHOOL.
Corning: CORNING UNION HIGH SCHOOL.
Corona: CORONA HIGH SCHOOL.
Coronado: CORONADO HIGH SCHOOL.
Covelo: ROUND VALLEY UNION HIGH SCHOOL.
Crescent City: DEL NORTE COUNTY HIGH SCHOOL.
Crockett: JOHN SWETT UNION HIGH SCHOOL.
Daly City: JEFFERSON UNION HIGH SCHOOL.
Danville: SAN RAMON VALLEY UNION HIGH SCHOOL.
Davis: DAVIS JOINT UNION HIGH SCHOOL.
Delano: DELANO JOINT UNION HIGH SCHOOL.
Denair: DENAIR UNION HIGH SCHOOL.
Dinuba: DINUBA UNION HIGH SCHOOL.
Dixon: DIXON UNION HIGH SCHOOL.
Dorris: BUTTE VALLEY HIGH SCHOOL.
Dos Palos: DOS PALOS JOINT UNION HIGH SCHOOL.
Downey: DOWNEY UNION HIGH SCHOOL.
Durham: DURHAM UNION HIGH SCHOOL.
East Nicolaus: EAST NICOLAUS HIGH SCHOOL.
Elk Grove: ELK GROVE UNION HIGH SCHOOL.
El Monte: EL MONTE UNION HIGH SCHOOL.
Elsinore: ELSINORE UNION HIGH SCHOOL.
Emeryville: EMERY JUNIOR-SENIOR HIGH SCHOOL.
Encinitas: SAN DIEGUITO UNION HIGH SCHOOL.
Escondido: ESCONDIDO UNION HIGH SCHOOL.
Etna: ETNA UNION HIGH SCHOOL.
Eureka: EUREKA SENIOR HIGH SCHOOL.
Exeter: EXETER UNION HIGH SCHOOL.
Fairfield: ARMIJO UNION HIGH SCHOOL.
Fair Oaks: SAN JUAN UNION HIGH SCHOOL.
Fallbrook: FALLBROOK UNION HIGH SCHOOL.
Ferndale: FERNDALE UNION HIGH SCHOOL.
Fillmore: FILLMORE UNION JUNIOR-SENIOR HIGH SCHOOL.
Folsom: FOLSOM UNION HIGH SCHOOL.
Fort Bragg: FORT BRAGG UNION HIGH SCHOOL.
Fortuna: FORTUNA UNION HIGH SCHOOL.
Fowler: FOWLER UNION HIGH SCHOOL.
Fresno:
CENTRAL UNION HIGH SCHOOL.
EDISON TECHNICAL HIGH SCHOOL.
FRESNO HIGH SCHOOL.
FRESNO STATE COLLEGE.
FRESNO TECHNICAL HIGH SCHOOL.
HAMILTON JUNIOR HIGH SCHOOL.
EDWIN C. KRATT, Assistant Superintendent of Schools.
LONGFELLOW JUNIOR HIGH SCHOOL.
ROOSEVELT HIGH SCHOOL.
WASHINGTON JUNIOR HIGH SCHOOL.
WASHINGTON UNION HIGH SCHOOL.
Fullerton:
FULLERTON UNION HIGH SCHOOL.
FULLERTON JUNIOR COLLEGE.
Galt: GALT JOINT UNION HIGH SCHOOL.
Garden Grove: GARDEN GROVE UNION HIGH SCHOOL.
Gilroy: GILROY HIGH SCHOOL.
Glendale:
GLENDALE HIGH SCHOOL.
GLENDALE JUNIOR COLLEGE.
HERBERT HOOVER HIGH SCHOOL.
Gonzales: GONZALES UNION HIGH SCHOOL.
Grass Valley:
GRASS VALLEY HIGH SCHOOL.
GRASS VALLEY HIGH SCHOOL DISTRICT.
Greenville: GREENVILLE JUNIOR-SENIOR HIGH SCHOOL.
Gridley: GRIDLEY UNION HIGH SCHOOL.
Gustine: GUSTINE UNION HIGH SCHOOL.
Half Moon Bay: HALF MOON BAY UNION HIGH SCHOOL.
Hanford: HANFORD JOINT UNION HIGH SCHOOL.
Hayward: HAYWARD UNION HIGH SCHOOL.
Healdsburg: HEALDSBURG HIGH SCHOOL.
Hemet: HEMET VALLEY UNION HIGH SCHOOL.
Hollister: SAN BENITO COUNTY HIGH SCHOOL AND JUNIOR COLLEGE.
Holtville: HOLTVILLE UNION HIGH SCHOOL.
Hoopa: HOOPA VALLEY HIGH SCHOOL.
Hopland: HOPLAND UNION HIGH SCHOOL.
Huntington Beach: HUNTINGTON BEACH UNION HIGH SCHOOL.
Imperial: IMPERIAL VALLEY UNION HIGH SCHOOL.
Inglewood:
INGLEWOOD UNION HIGH SCHOOL DISTRICT.
LEUZINGER HIGH SCHOOL, LAWNDALE.
Ione: IONE UNION HIGH SCHOOL.
Jackson: JACKSON UNION HIGH SCHOOL.
Julian: JULIAN UNION HIGH SCHOOL.
Kelseyville: KELSEYVILLE UNION HIGH SCHOOL.
Kentfield: MARIN UNION JUNIOR COLLEGE.
Kerman: KERMAN UNION HIGH SCHOOL.
King City: KING CITY UNION HIGH SCHOOL.
Kingsburg: KINGSBURG JOINT UNION HIGH SCHOOL.

Lafayette: ACALANES UNION HIGH SCHOOL.
Laguna Beach: LAGUNA BEACH HIGH SCHOOL.
Lakeport: CLEAR LAKE UNION HIGH SCHOOL.
Lancaster: ANTELOPE VALLEY JOINT UNION HIGH SCHOOL AND JUNIOR COLLEGE.
Laton: LATON JOINT UNION HIGH SCHOOL.
La Verne:
BONITA UNION HIGH SCHOOL.
LA VERNE COLLEGE.
Le Grande: LE GRANDE UNION HIGH SCHOOL.
Lemoore:
AVENAL HIGH SCHOOL, Avenal.
LEMOORE UNION HIGH SCHOOL, Lemoore.
Lincoln: LINCOLN UNION HIGH SCHOOL.
Linden: LINDEN UNION HIGH SCHOOL.
Lindsay: LINDSAY HIGH SCHOOL.
Live Oak: LIVE OAK UNION HIGH SCHOOL.
Livermore: LIVERMORE UNION HIGH SCHOOL.
Livingston: LIVINGSTON HIGH SCHOOL.
Lodi: LODI UNION HIGH SCHOOL.
Lomita: CHADWICK SEASIDE SCHOOL, Rolling Hills.
Lompoc: LOMPOC UNION HIGH SCHOOL.
Lone Pine: LONE PINE UNION HIGH SCHOOL.
Long Beach:
DAVID STARR JORDAN HIGH SCHOOL.
WOODROW WILSON HIGH SCHOOL.
Los Angeles:
JOHN ADAMS JUNIOR HIGH SCHOOL.
AUDOBON JUNIOR HIGH SCHOOL.
BLACK-FOXE MILITARY INSTITUTE.
RALPH WALDO EMERSON JUNIOR HIGH SCHOOL, West Los Angeles.
JOHN H. FRANCIS POLYTECHNIC EVENING HIGH SCHOOL.
JOHN C. FREMONT HIGH SCHOOL.
JAMES A. GARFIELD HIGH SCHOOL.
IMMACULATE HEART COLLEGE.
HORACE MANN JUNIOR HIGH SCHOOL.
MARLBOROUGH SCHOOL.
SOUTH GATE HIGH SCHOOL (P. O., South Gate).
UNIVERSITY OF SOUTHERN CALIFORNIA.
VAN NUYS HIGH SCHOOL, Van Nuys.
WESTLAKE SCHOOL FOR GIRLS.
FRANK WIGGINS TRADE EVENING SCHOOL.
Los Banos: WEST SIDE UNION HIGH SCHOOL.
Los Gatos: LOS GATOS UNION HIGH SCHOOL.
Los Molinos: LOS MOLINOS HIGH SCHOOL.
Los Olivos: MIDLAND SCHOOL.
Lower Lake: LOWER LAKE UNION HIGH SCHOOL.
Madera: MADERA UNION HIGH SCHOOL.
Manteca: MANTECA UNION HIGH SCHOOL.
Maricopa: MARICOPA JUNIOR-SENIOR HIGH SCHOOL.
Martinez: ALHAMBRA SENIOR HIGH SCHOOL.
Marysville: YUBA COUNTY JUNIOR COLLEGE.
Maxwell: MAXWELL UNION HIGH SCHOOL.
McArthur: FALL RIVER JOINT UNION HIGH SCHOOL.
Mendocino: MENDOCINO UNION HIGH SCHOOL.
Menlo Park: MENLO SCHOOL AND JUNIOR COLLEGE.
Merced: MERCED UNION HIGH SCHOOL.
Middletown: MIDDLETOWN UNION HIGH SCHOOL.
Mill Valley: TAMALPAIS UNION HIGH SCHOOL.
Miranda: SOUTH FORK UNION HIGH SCHOOL.
Modesto:
MODESTO CITY SCHOOL DEPARTMENT.
MODESTO HIGH SCHOOL.
Monrovia: MONROVIA - ARCADIA - DUARTE UNION HIGH SCHOOL.
Montebello: MONTEBELLO UNIFIED SCHOOL DISTRICT.
Moorpark: MOORPARK MEMORIAL UNION HIGH SCHOOL.
Morgan Hill: LIVE OAK UNION HIGH SCHOOL.
Napa: NAPA JUNIOR COLLEGE.
Needles: NEEDLES JUNIOR-SENIOR HIGH SCHOOL.
Nestor: SOUTHWEST JUNIOR HIGH SCHOOL.
Nevada City: NEVADA CITY HIGH SCHOOL.
Newman: ORESTIMBA UNION HIGH SCHOOL.
Newport Beach: NEWPORT HARBOR UNION HIGH SCHOOL.
North Sacramento: GRANT UNION HIGH SCHOOL.
Norwalk: EXCELSIOR UNION HIGH SCHOOL.
Oakdale: OAKDALE UNION HIGH SCHOOL.
Oakland:
CALIFORNIA COLLEGE OF ARTS AND CRAFTS.
CASTLEMONT HIGH SCHOOL.
COLLEGE OF THE HOLY NAMES.
FREMONT HIGH SCHOOL.
MCCLYMONDS HIGH SCHOOL.
MERRITT BUSINESS SCHOOL.
OAKLAND HIGH SCHOOL.
ROOSEVELT HIGH SCHOOL.
SAN LEANDRO HIGH SCHOOL, SAN LEANDRO.
TECHNICAL HIGH SCHOOL.
UNIVERSITY HIGH SCHOOL.
Oceanside: OCEANSIDE-CARLSBAD UNION HIGH SCHOOL.
Ojai:
NORDHOFF UNION HIGH SCHOOL
THE THACHER SCHOOL.
Ontario: CHAFFEY UNION HIGH SCHOOL AND JUNIOR COLLEGE.
Orange: ORANGE UNION HIGH SCHOOL.
Orland: ORLAND JOINT UNION HIGH SCHOOL.
Oroville: OROVILLE UNION HIGH SCHOOL.
Oxnard: OXNARD UNION HIGH SCHOOL.
Pacific Grove: PACIFIC GROVE HIGH SCHOOL.
Palo Alto: PALO ALTO JUNIOR-SENIOR HIGH SCHOOL.
Parlier: PARLIER UNION HIGH SCHOOL.
Pasadena:
FLINTRIDGE PREPARATORY SCHOOL FOR BOYS.
PASADENA JUNIOR COLLEGE.
WESTERN PERSONNEL SERVICE.
WESTRIDGE SCHOOL FOR GIRLS.
Paso Robles: PASO ROBLES UNION HIGH SCHOOL.
Perris: PERRIS UNION HIGH SCHOOL.
Pescadero: PESCADERO UNION HIGH SCHOOL.
Pine Valley: MOUNTAIN EMPIRE UNION HIGH SCHOOL.
Pittsburg: PITTSBURG HIGH SCHOOL.
Placentia: VALENCIA HIGH SCHOOL.
Pleasanton: AMADOR VALLEY JOINT UNION HIGH SCHOOL.
Point Arena: POINT ARENA UNION HIGH SCHOOL.
Pomona: POMONA JUNIOR COLLEGE.
Porterville: PORTERVILLE UNION HIGH SCHOOL AND JUNIOR COLLEGE.
Portola: PORTOLA JUNIOR-SENIOR HIGH SCHOOL.
Princeton: PRINCETON JOINT UNION HIGH SCHOOL.
Puente: PUENTE UNION HIGH SCHOOL.
Raymond: RAYMOND GRANITE UNION HIGH SCHOOL.
Red Bluff: RED BLUFF UNION HIGH SCHOOL.
Redding: SHASTA UNION HIGH SCHOOL.
Redlands:
REDLANDS HIGH SCHOOL.
UNIVERSITY OF REDLANDS.
Redondo Beach: REDONDO UNION HIGH SCHOOL.
Redwood City: SEQUOIA UNION HIGH SCHOOL.
Reedley: REEDLEY JOINT UNION HIGH SCHOOL AND JUNIOR COLLLEGE.
Rio Vista: RIO VISTA JOINT UNION HIGH SCHOOL.
Ripon: RIPON UNION JUNIOR-SENIOR HIGH SCHOOL.
Roseville: ROSEVILLE UNION HIGH SCHOOL.
Ross: THE KATHERINE BRANSON SCHOOL.

Sacramento:
C. K. McClatchy Senior High School.
Sacramento Evening Junior College.
Sacramento Junior College.
St. Helena: St. Helena Union High School.
Salinas:
Salinas Junior College.
Salinas Union High School.
San Andreas: Calaveras Union High School.
San Bernardino: San Bernardino Valley Union Junior College.
San Diego:
Richard Henry Dana Junior High School.
Horace Mann Junior High School.
Roosevelt Junior High School.
San Diego High School.
San Diego State College.
San Francisco:
San Francisco College for Women.
San Francisco Continuation School.
San Francisco Junior College.
San Francisco State College.
University of San Francisco.
Sanger: Sanger Union High School.
San Jacinto: San Jacinto High School.
San Jose:
Peter H. Burnett Junior High School.
Herbert Hoover Junior High School.
Abraham Lincoln High School.
Theodore Roosevelt Junior High School.
San Jose Senior High School.
San Jose Technical High School.
Woodrow Wilson Junior High School.
San Juan Capistrano: Capistrano Union High School.
San Luis Obispo: San Luis Obispo High School District.
San Mateo:
San Mateo District Junior College.
San Mateo High School.
San Rafael: San Rafael High School.
Santa Ana: Santa Ana High School and Junior College.
Santa Barbara:
La Cumbre Junior High School.
Santa Barbara Junior High School.
Santa Barbara Senior High School.
Santa Cruz:
Santa Cruz City School Department.
Santa Cruz High School.
Santa Maria: Santa Maria Union High School and Junior College.
Santa Monica:
Santa Monica City School Department.
Santa Monica Junior College.
Santa Paula: Santa Paula Union High School.
Santa Rosa: Santa Rosa High School.
Santa Ynez: Santa Ynez Valley Union High School.
Sebastopol: Analy Union High School.
Selma: Selma Union High School.
Shandon: Shandon Union High School.
Simi: Simi Valley High School.
Sonoma: Sonoma Valley Union High School.
South Pasadena: South Pasadena-San Marino High School District.
South San Francisco: South San Francisco Unified School District.
Stockton:
Edison High School.
Schneider Vocational School.
Stockton High School.
Stockton Junior College.
Sunnyvale: Fremont Union High School.
Susanville: Lassen Union High School and Junior College.
Sutter: Sutter Union High School.
Sutter Creek: Sutter Creek Union High School.
Taft: Taft Union High School and Junior College.
Tehachapi: Tehachapi Valley Union High School.
Templeton: Templeton Union High School.
Tomales: Tomales Joint Union High School.
Tracy: Tracy Union High School.
Tranquillity: Tranquillity Union High School.
Trona: Trona High School.
Tulare: Tulare Union High School.
Tulelake: Tulelake High School.
Turlock: Turlock Union High School.
Ukiah: Ukiah Union High School.
Vallejo: Vallejo Junior High School.
Ventura:
Ventura Evening High School and Junior College.
Ventura Junior College.
Ventura Junior High School.
Victorville: Victor Valley Union High School.
Vista: Vista Junior-Senior High School.
Wasco: Wasco Union High School.
Watsonville: Watsonville Union High School.
Weaverville: Trinity County High School.
Westwood: Westwood Junior-Senior High School.
Wheatland: Wheatland Union High School.
Whittier: Whittier Union High School.
Williams: Williams Union High School.
Willits: Willits Union Junior-Senior High School.
Willows: Glenn County Union High School.
Winters: Winters Joint Union High School.
Woodlake: Woodlake Union High School.
Woodland: Woodland High School.
Yuba City: Yuba City Union High School.

THE DEVELOPMENT OF AMERICA

By **FREMONT P. WIRTH**

Chairman of the Division of Social Science
George Peabody College for Teachers
Nashville, Tennessee

★ ★ ★

FOR SEVERAL YEARS high school teachers of American history have sought "a warp and a woof" organization of chronological and topical treatments. Most texts have unduly stressed one or the other.

This Wirth text (1943 edition) offers a happy combination: Seven units dealing with *finished* problems (independence, slavery, westward expansion, etc.) chronologically; and five units presenting *current* problems (agriculture, industry, labor, foreign relations, cultural development, etc.) topically.

Unit One: From the Old World to the New
Unit Two: The Beginnings of the American People and Institutions
Unit Three: The Struggle for American Independence
Unit Four: The Founding of American Nationality
Unit Five: The Development of American Nationalism and Democracy
Unit Six: The Westward Movement Stimulates American Democracy
Unit Seven: The Slavery Controversy
Unit Eight: The Industrialization of the United States
Unit Nine: How the Industrial Revolution Changed Transportation and Communication
Unit Ten: The Development of Our International Relations
Unit Eleven: American Life and Culture in the Nineteenth and Twentieth Centuries
Unit Twelve: Our Political History Since 1868
Recent Events: The United States at War

Illustrated, 796 Pages, $2.40

AMERICAN BOOK COMPANY

121 SECOND STREET, SAN FRANCISCO

NEW YORK **CINCINNATI** **CHICAGO**

LEDERER, STREET & ZEUS COMPANY

Printers specializing in the production of school yearbooks

▼

CORRESPONDENCE IS INVITED

▼

2121 ALLSTON WAY • BERKELEY, CALIFORNIA

▼ We have gathered about us a sincere and conscientious group of men and women who are actively and entirely occupied with but three thoughts—the thoughts of QUALITY, SERVICE and VALUE in the sale and manufacture of the printed piece.

▼ If you are not certain of these three attributes before placing your next printing order, we invite you to visit one of the most modern printing plants on the Pacific Coast, meet our organization, and let us prove to you how profitable the blending of your ideals and ours will be.

The James H. Barry Company

PRINTERS AND PUBLISHERS

170 SOUTH VAN NESS AVENUE
SAN FRANCISCO, CALIFORNIA
Telephone UNderhill 7780

CALIFORNIA JOURNAL
OF SECONDARY EDUCATION

EDITORIAL BOARD

EDWARD H. REDFORD.....*Editor*

AUBREY A. DOUGLASS.....*Managing Director*

Editorial Office: Rooms 9-10, Haviland Hall, Berkeley, California

CONSULTANT EDITORS (Ex-officio Members)

HAROLD BENNETT BROOKS, President, Association of California Secondary School Principals; Principal, George Washington Junior High School, Long Beach.

A. J. CLOUD, President, Western Association of Colleges and Secondary Schools; President, San Francisco Junior College, San Francisco.

FRANK N. FREEMAN, Dean of the School of Education, University of California, Berkeley.

GRAYSON N. KEFAUVER, Dean of the School of Education, Stanford University.

EDWIN A. LEE, Dean of the Department of Education, University of California at Los Angeles.

LESTER B. ROGERS, Dean of the School of Education, University of Southern California, Los Angeles.

FRANK W. THOMAS, President, California Society of Secondary Education; President, Fresno State College.

ASSOCIATE EDITORS

MARGARET BENNETT, Director of Guidance, Pasadena City Schools.

R. W. BORST, English Department, Junior College, Fullerton.

BERNICE BUDLONG, California Home Economics Association; Supervisor of Domestic Arts, San Jose.

E. C. CLARK, California Elementary School Principals' Association; Superintendent, Reefe-Sunset District, Avenal.

MARGARET H. ERDT, Supervisor of Art, City School Department, San Bernardino.

MARGARET GIRDNER, California Library Association; Supervisor of Texts and Libraries, City Public Schools, San Francisco.

MRS. E. T. HALE, President, California Congress of Parents and Teachers, Inc., San Diego.

ROSCO CHANDLER INGALLS, Director, Los Angeles City College.

CECELIA IRVINE, Head of Economics and History Department, University High School, West Los Angeles.

W. W. KEMP, Professor of Education, University of California, Berkeley.

WILLIAM J. KLOPP, Supervisor of Instruction in Senior High Schools and Junior College, Long Beach.

GERTRUDE LAWS, Director of Education for Women, Pasadena City School Department, Pasadena.

FRANK B. LINDSAY, Assistant Superintendent of Public Instruction and Chief of the Division of Secondary Education, State Department of Education.

G. C. MANN, Chief of Division of Adult and Continuation Education, State Department of Education, Los Angeles.

LEE W. RALSTON, California Industrial Education Association; Supervisor of Trade Industrial Teacher Training, University of California, Berkeley.

JOSEPHINE V. RAUSCH, Social Studies, George Washington Senior High School, San Francisco.

WILLIAM A. SMITH, Professor of Education (Secondary), University of California at Los Angeles.

MRS. RUTH G. SUMNER, Mathematical Association of America—Northern California Section; Mathematics Department, Oakland High School, Oakland.

L. A. WILLIAMS, Professor of Education, University of California, Berkeley.

HELEN L. WIRT, Department of Dramatics, Oakland High School, Oakland.

F. M. YOCKEY, Principal, Technical Evening High School, Oakland.

AIR NAVIGATION WORKBOOK

By

LT. A. D. BRADLEY, *U.S.N.R.*

and

DR. CLIFFORD B. UPTON, *Teachers College, Columbia Univ.*

★ ★ ★

THIS WORKBOOK has been planned for high school pupils in the tenth, eleventh, or twelfth years. It covers the topics in Air Navigation recommended by the U. S. Office of Education and the National Council of Teachers of Mathematics, and approved by the Army, the Navy, and the Civil Aeronautics Administration. It can be handled readily by mathematics teachers without previous training in air navigation.

***Unit A* (1–49)**

Use of Scales and Protractor; Plotting Courses and Distances; Finding Positions by Two Bearings and by Radio Signals; Parallelogram of Forces; Effect of the Wind on a Plane; Finding Heading, Track, and Ground Speed; Drift Angle.

***Unit B* (50–56)**

Finding Radius of Action with and without Wind; Formulas for Computing Radius and Time.

***Unit C* (57–69)**

Distance of a Plane from a Moving Base; Land and Nautical Miles; The Knot.

***Unit D* (70–83)**

Finding the Course and the Time Necessary for One Plane to Intercept Another.

***Unit E* (84–88)**

The Magnetic Compass; Declination; Magnetic Bearings; True Bearings.

***Unit F* (89–101)**

Three Interesting Problems in Marine Navigation: (1) Doubling the Angle on the Bow; (2) The Danger Angle; (3) The Three-Point Problem.

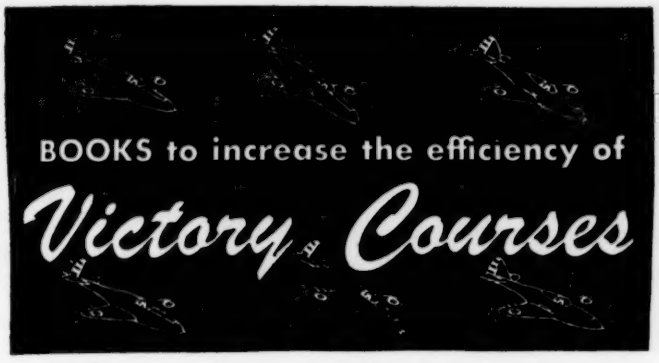
These units are flexible. If time is limited, omissions other than **Unit A** are suggested. Ample review exercises and answers for entire Workbook are provided. Protractor and scales are placed in pocket-flap.

Pages 112 . . . Price 88 cents

AMERICAN BOOK COMPANY

121 SECOND STREET, SAN FRANCISCO

NEW YORK **CINCINNATI** **CHICAGO**



Published by

THE MACMILLAN COMPANY

350 Mission St.

San Francisco, 5

Physics

BLACK–DAVIS:

Elementary Practical Physics

A standard leader; simple presentation of fundamental principles in operation today. $2.20.

Chemistry

BLACK–CONANT:

New Practical Chemistry, Revised

The leader in its field, recently revised, superbly equipped for wartime teaching. $2.20.

Algebra

LENNES:

Algebras

A First Course; A Second Course — Revised Editions of the simplest presentations ever made. $1.56; $1.80.

Geometry

SEYMOUR–SMITH:

Geometries

Plane Geometry; and the newly published Solid Geometry containing a unit on spherical trigonometry. $1.72; $1.60.

Health

WILLIAMS:

Healthful Living, 3rd Revised

Today's front-line high-school text in physiology and and hygiene. $1.80.

Aviation

Science of Pre-Flight Aeronautics

Elements of Pre-Flight Aeronautics

Doing the job of preparing thousands of young Americans for the air. Prepared with the co-operation of the C. A. A. $1.32; $0.96.

Pre-Induction

JOHNSON–NEWKIRK:

Fundamentals of Shopwork

Fundamentals of Electricity

Texts that follow with absolute conformity the Army specifications in skilled training. Each, $1.32.

New Superintendent Takes Office in San Francisco

CURTIS E. WARREN, San Francisco's new superintendent of schools, took over his duties on July 1. He succeeds Joseph P. Nourse, who announced his retirement late last spring.

Dr. Warren goes to San Francisco from the superintendency at Santa Barbara. A corporate member of the California Society of Secondary Education, he has been active in secondary education in California since he first started teaching at Antelope Valley Union High School, Lancaster, about twenty-five years ago.

At Santa Barbara Dr. Warren was largely responsible for the extensive program of curriculum study which brought both county and city teachers together to develop a curriculum suited to the individual needs of the children in their schools. The revision program was unique in that it utilized for a number of years the services of the entire staff of Stanford's School of Education on an intensive consultative basis.

In making his first appearance before the teachers of San Francisco, Dr. Warren said:

A good educational program will strive to preserve the natural intellectual curiosity and creativity of those whom it teaches. To attain this objective is a problem of methodology. No one group has a mortgage on the best plan, but within the framework of whatever plan is utilized there must be opportunity for the imagination and independence of individual teachers.

Much has been said about pupil and teacher planning, but I am not sure too much has been done about it. It is, however, a desirable objective. In the days to come, I trust this will be an ever-increasing relationship. For over a thousand years we have been adjured to teach children to think critically and without prejudice. Professors, teacher-training institutions, supervisors, principals, hammered at teachers to attain this end. But precious little instruction has been given to attain it.

After years of thinking about it, I am constrained to believe that this is best accomplished by giving children real problems with which to work. Such problems taken from life have the advantage of arousing the average child's interest, and he may even see purpose in them. If he does, so much the better—for you may awaken to find that your students are actually doing critical thinking.

Member of Board of Trustees Retires

AFTER thirty-three years of almost continuous service in the junior college field in California, Albert C. Olney has retired as president of Marin Junior College, Kentfield. Mr. Olney is at present a member of the Board of Trustees of the California Society of Secondary Education and is one of a faithful group of supporters of the Society who saw it through the early years of its struggle to become established.

Mr. Olney became the first president of Marin Junior College in 1926, going there from the State Department of Education. He had served as commissioner of secondary schools for seven years, during a time when the junior college was gaining recognition in California. It was while Mr. Olney was commissioner of secondary schools that the District Junior College Law of 1921 was enacted, an act which placed the junior college on a stable foundation, educationally and financially.

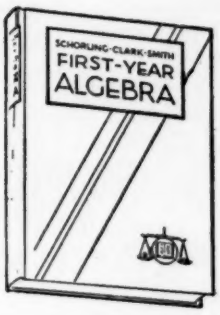
Mr. Olney was principal of the Fresno High School from 1900 to 1910 and while there was chiefly responsible for the organization of the first junior college in California. From Fresno he went to Santa Barbara, where he organized the second junior college in the State.

Of Mr. Olney, Walter Crosby Eells says in a recent issue of the *Junior College Journal*, "President Olney has had a longer influential contact with junior college developments in California than any other educator in the field."

TIMELY MATHEMATICS TEXTBOOKS

by recognized authorities

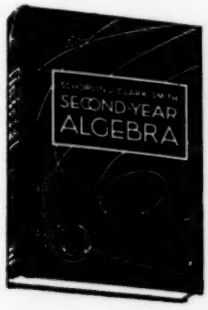
RALEIGH SCHORLING, JOHN R. CLARK, and ROLLAND R. SMITH



FIRST-YEAR ALGEBRA

Notable for its new approach—the treatment of algebra as an extension of arithmetic—thus the subject becomes understandable and concrete. An analysis of students' difficulties formed the basis for special training of those processes which are ordinarily hard to master.

SECOND-YEAR ALGEBRA

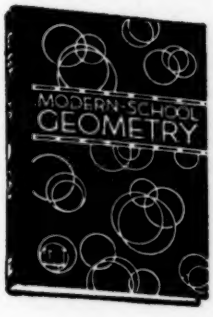


Already adopted for a strong second-year course in high schools the country over. It emphasizes both mastery of techniques and understanding of concepts, without which mathematics cannot be applied to its many war-time uses.

MODERN-SCHOOL GEOMETRY

Revised with AERONAUTICS SUPPLEMENT

Mathematical training for today's technological needs. Its method has proved its success in surmounting the usual difficulties. The supplementary chapter on geometry in aeronautics includes problems on Establishing a Fix, Interception, Wind Drift, and Radius of Action.



MODERN-SCHOOL SOLID GEOMETRY

Achieves classroom interest and teachability by a modern teaching method and clear, simple presentations. Frequent developmental exercises increase students' understanding of new topics.

WORLD BOOK COMPANY

149 New Montgomery Street San Francisco 5, Calif.

CALIFORNIA CHILD LABOR LAWS

The chart below gives the pertinent points of the child labor laws as they affect minors in California. For all exceptions and details of the California law, see "Digest of California Child Labor Laws" available through the Division of Labor Statistics and Law Enforcement, 515 Van Ness Avenue, San Francisco. For the Federal law, see Folder 26, "Ten Questions Answered About The Child Labor Provisions of Fair Labor Standards Act," and Folder 27, "Hazardous Occupations Subject To Minimum Age of 18 Years Under Fair Labor Standards Act," available through the office of the Children's Bureau, Department of Labor, 785 Market Street, San Francisco. Information on work permits may be secured through Bureau of Attendance, San Francisco Board of Education.

The statements preceded by the sign (•) are provisions of the California Child Labor Law.
The statements preceded by the sign (#) are the Child Labor provisions of the Fair Labor Standards Act and apply only to producers, manufacturers or dealers who ship or deliver goods for shipment in interstate or foreign commerce.

	FOR ALL MINORS UNDER AGE 18	ADDITIONAL SPECIAL REGULATIONS APPLYING TO:		
WORK PERMITS	ARE REQUIRED	Ages 16 - 17	Ages 14 - 16	Ages 12 - 13
SCHOOL ATTENDANCE	•Is required unless a high school graduate.	•If regularly employed and not a high school graduate, must attend Continuation school at least 4 hours a week. When not regularly employed and not a high school graduate, must attend Continuation School at least 3 hours a day.	•MUST ATTEND FULL TIME SCHOOL For few exceptions for minors 14 and 15 years of age, see California Child Labor Law.	
HOURS OF WORK	Are •Daily maximum, 8 hours including time spent in school. •Weekly maximum, 48 hours.	•Exception: no limitation in agriculture, horticulture, viticulture or domestic labor.	•May be employed after school, Saturdays and vacations only. #When school is in session, daily maximum, 3 hours; weekly maximum, 18 hours. #When school is not in session, daily maximum, 8 hours; weekly maximum, 40 hours.	•May be employed Saturdays and vacations only. #May not be employed by firms covered by Fair Labor Standards Act.
SPREAD OF HOURS	•Work must be performed between 5 a.m. and 10 p.m. •Exception: Public messenger service must be performed between 6 a.m. and 9 p.m.		#Work must be performed between 7 a.m. and 7 p.m. #Amendment allows employment to 10 p.m. provided not more than 8 hours are worked in any one day.	
OCCUPATIONS	Prohibited are: #All occupations declared to be particularly hazardous by Chief of Children's Bureau. •For girls, public messenger service and street occupations. Selling or serving alcoholic beverages. (Provision of Alcoholic Beverage Control Act, applying to all minors under 21 years of age.)		May not be employed: •In hazardous occupations. #•In public messenger service. •In construction work. •In delivering goods from motor vehicles. •In operating auto or truck. •In bowling alley, pool or billiard room. •In vicinity of moving machinery. #In manufacturing, mining or processing, hand or machine. (1) Exception: See below under agriculture.	
WAGES	See schedules of Division of Industrial Welfare for various industries.	#Must be paid overtime for hours in excess of 40 hours.	#Must be paid minimum wages established by Fair Labor Standards Act.	
AGRICULTURE	•Laws regarding work permits, school attendance, hours of work and spread of hours apply. •Exception: work permits not required if minors are employed on farms owned and operated by parents.	•Exception: No limitation on hours of work or spread of hours.	•May be employed after school, Saturdays and vacations only. #(1) May be employed in cutting of pears, peaches and apricots in fruit-drying yards. •Hours of work: Daily maximum, 8 hours, including time spent in school; weekly maximum, 48 hours.	•May work vacations and Saturdays only. Exception: Federal Sugar Beet Act prohibits harvesting or cultivation of sugar beets.

The above chart was prepared by the Junior Division of the United States Employment Service, San Francisco, with the assistance and approval of the following agencies: The California Division of Labor Statistics and Law Enforcement; the Children's Bureau, United States Department of Labor; and the Bureau of Attendance, San Francisco Public Schools. Copies of it are being distributed to school personnel, employers, and to various public and private agencies dealing with youths of the ages involved. Two other charts, outlining the entire procedure involved in the granting of work permits, also are being distributed as a part of the general effort of the San Francisco Public Schools to control the situation that develops when industry is calling for more assistance from boys and girls of school age, when work opportunities are as attractive as they are at present, and when there is such an influx of families from other sections of the country. The distribution of these charts is being handled under the direction of Albert D. Graves, deputy superintendent in charge of Secondary schools.